The 10th IEEE International Conference on Awareness Science and Technology (iCAST 2019)
October 23-25, Morioka, Japan
Conference Program

Sponsor:

Japan Chapter of IEEE Systems, Man and Cybernetics Society (SMCS).

Supporters:

Iwate Prefectural University, Japan,

IEEE SMCS Technical Committee on Awareness Computing,

IEEE CIS Task Force on Awareness Computing,

IEEE Sendai Section,

IEEE Society on Social Implications of Technology (SSIT).

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Welcome Message from iCAST 2019 General Chairs

Kon'nichiwa! Welcome to iCAST 2019.

On behalf of iCAST 2019 conference committee, it is our pleasure to welcome you to Morioka, Iwate Prefecture, to participate in the 10th. International Conference on Awareness Science and Technology. This conference was born at the University of Aizu in 2009, traveled to different cities in Taiwan, Korea, China, France, and Japan. We are fortunate to have the opportunity to organize the 10th. Conference in our beautiful Morioka City, during golden autumn season.

The motivation of iCAST conferences is to find ways to embed human awareness in intelligent systems and machine learning algorithms, for example improving system efficiency/performance with apparently irrelevant cues from the environment, or attending to subset of the input information, as we human always do. It covers most of the areas of interest in intelligent systems, including IoT and big-data.

iCAST 2019 Conference is enriched by nine special sessions on important problems and research topics of our time, including a special session on "Disaster Awareness Communication System", the importance of which was severely felt over Tsunami affected areas, in 2011 great North Japan Earthquake. The general session attracted more than 40 submissions on various issues and applications in machine learning. We received about 130 submissions from 16 different countries, and arduously selected 97 papers for presentation in the conference. We organized a special invited session on Security Awareness, both from the perspective of users as well as application creators. Two keynote speakers will talk about the latest development in the field of BMI and a new perspective in neural network learning. We also, for the first time, included a special session organized by IEEE Women in Engineering (WIE) Affinity Group.

Coming back to our venue, Morioka City, is surrounded by mountains now bright with colored leaves of Autumn. Around Morioka, the gorges are gorgeous, lakes on the mountains reflecting deep blue sky, hot springs are within easy reach, sunsets on the rugged coastline is heavenly. In Japanese, we say, "Shokuyoku no Aki", a free translation would be "The Autumn is to enjoy delicious food". Iwate Prefecture grows best quality rice, vegetables, fruits, and sake. Umpteen number of restaurants and bars around the venue serve delicious local cuisines and sake. Please enjoy!

We are very thankful to IEEE SMC Japan Chapter for extending full sponsorship. Our greatest support came from President Suzuki of Iwate Prefectural University. His assurances gave us the courage to undertake this endeavor. Prof. Hideyuki Takagi, a member of the Conference Advisory Committee, extended his help from the very beginning and shared his experiences as general chair of iCAST 2018. We are sincerely thankful to all organizing committee members. Our success is the result of their constant effort. We are grateful, and appreciate Prof. Junyu Dong who came forward to organize iCAST 2020 at the Ocean University of China, in the City of Qingdao, China. Last but not least, we are thankful to all authors who confided and submitted their works in our conference. Without those more than 130 paper submissions, we could not hold this meeting successfully. Sincere thanks to all reviewers who worked hard, in their busy schedule, to submit review reports in time.

Goutam Chakraborty
General Chair
Iwate Prefectural University, Japan

Rung-Ching Chen
General Chair
Chaoyang University of Technology, Taiwan

Welcome Message from iCAST 2019 Program Chairs

On behalf of the Program Committee of The 10th International Conference on Awareness Science and Technology (iCAST 2019), we welcome your participation and contribution to IEEE iCAST 2019 to be held at Aiina, Morioka, Iwate, Japan in October 23 - 25, 2019.

IEEE iCAST 2019 totally received 126 valid submissions from 317 authors in 16 countries. The submissions per region were Japan the largest share (49%), Taiwan (28%), India (17%), Indonesia (11%), Thailand (9%), China (6%) and so on. For discussing the promising techniques in awareness, we have 9 special sessions including Awareness Technology for Economic and Social Data Analysis, The Data Analysis and Intelligent Computing for Awareness Applications, Technologies for Women - The Good, the bad and the ugly, Intuitive Human-System Interaction, Text Mining and Analytics, Disaster Awareness Communication Networks, Systems, and Applications, Security and Privacy in Data-Aware Systems, Advances on Biomedical Informatics and Engineering for Healthcare and Medical Data Analytics. Thanks to the strong efforts of 115 International Program Committee members, 97 papers have been finally selected for presentation at the conference. The total acceptance rate is 77.0[%] and each acceptance rate for the special sessions is as follows.

Session			
	# Submission	# Acceptance	Acceptance rate [%]
General Session			
	42	35	83.3
Special Session: Awareness Technology for Economic and Social Data Analysis			
	8	5	62.5
Special Session: The Data Analysis and Intelligent Computing for Awareness Applications			
	18	12	66.7
Special Session: Technologies for Women – The Good, the bad and the ugly			
	8	7	87.5
Special Session: Intuitive Human-System Interaction			
	6	5	83.3
Special Session: Text Mining and Analysis			
	9	7	77.8
Special Session: Disaster Awareness Communication Networks, Systems, and Applications			
	4	3	75.0
Special Session: Security and Privacy in Data-Aware Systems			
	15	11	73.3
Special Session: Advances on Biomedical Informatics and Engineering for Healthcare			
	8	7	87.5
Special Session: Medical Data Analysis			
	8	5	62.5
Total			
	126	97	77.0

Almost all papers have been reviewed by at least three PC members except a few papers with two reviews. We would like to deliver our appreciation to the session chairs for their hard work.

Meanwhile, we organized a special invited session on Security Awareness, both from the perspective of user as well as application creators. It includes 4 papers.

Finally, we would like to thank Dr. Vinod A Prasad and Dr. Wen-Liang Hwang to deliver their Plenary Talks in IEEE iCAST 2019.

We hope that we could compile an interesting program for these three days that will appeal all attendees of the conference, and give sufficient opportunities to present newest research, unrevealing new research directions and many plans for future collaborations. Looking forward to meeting you all in Morioka this autumn.

Masafumi Matsuhara
Program Chair
Iwate Prefectural University, Japan

Yusuke Manabe
Program Chair
Chiba Institute of Technology, Japan

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Zhu	Xin	The University of Aizu, Japan
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Zurada	Jacek	University of Louisville, USA
廖	俊鑑	Chaoyang University of Technology, Taiwan

Venue
aiina

5th&7th & 8th Fl., Morioka, Iwate, Japan.

Address: 1-7-1, Morioka Station West, Morioka-shi, Iwate, 020-0045 (4 mins. walk from JR Morioka Station)

Welcome party, Lunch, Reception and Banquet
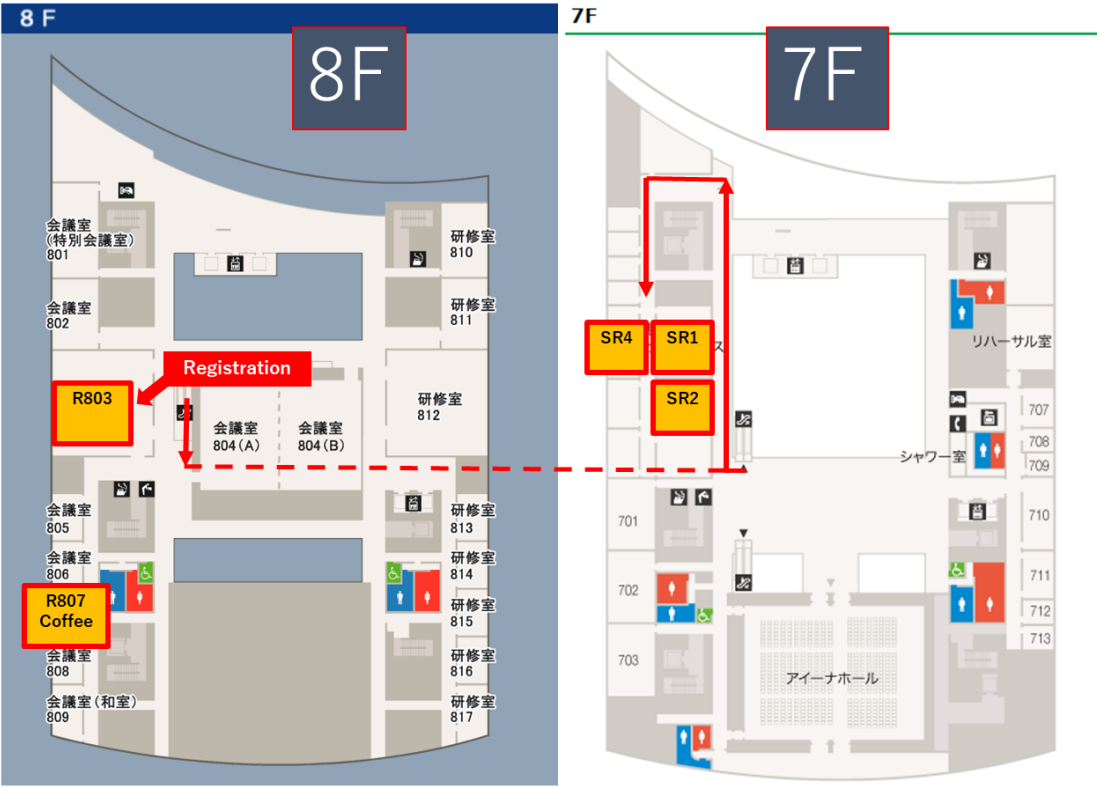

Room 803(8F):Registration Oct 23-25. am.9:00-

1F Restaurants, Shop,

aiina

Marios

Morioka Station

4F,20F Restaurants

20F: Welcome Party Oct 23. 18:00-20:30

Banquet: Art Hotel Oct.24 19:00-21:30

Conference Venue "aiina"

Banquet Place "Art Hotel"

1km (15 minute walk)

Conceference Rooms

Overview of Program

For Conference

R803: Room 803 (8F), R501: Room 501 (5F),

SR1: Study Room 1 (7F), SR2: Study Room 2 (7F), SR4: Study Room 4 (7F)

For Coffee Break

R807: Room 807 (8F)

October 23

Time	Room 803	Study Room 1	Study Room 2	Study Room 4	Room 501
9:00	Registration Starts				
9:30 – 10:00	Opening				
10:00 – 11:00	Keynote 1 [Vinod A Prasad]				
11:00 – 11:30	Coffee Break (at Room 807)				
11:30 – 12:00	Invited Talk 1 [Glenn Mansfield Keeni et al.]				
12:00 – 12:30	Invited Talk 2 [Hiroshi Yoshiura]				
12:30 – 13:50	Lunch				
13:50 – 14:20	Invited Talk 3 [Peter Burgstaller]	IEEE Women in Engineering (WIE): Technologies for Women - The Good, the bad and the ugly (1) [70] [81] [82]			
14:20 – 14:50	Invited Talk 4 [Toyoo Takata et al.]				
14:50 – 15:20	Coffee Break (at Room 807)				
15:20 – 16:20	General Session 1 [6] [19] [112]	IEEE Women in Engineering (WIE): Technologies for Women - The Good, the bad and the ugly (2) [83] [86] [108] [125]	Special Session: Text Mining and Analytics [60] [68] [93] [97] [98] [110] [127]	Special Session: Awareness Technology for Economic and Social Data Analysis [24] [17] [29] [131] [135]	
16:40					
17:00		IEEE Woman in Engineering (WIE): Panel Discussion			
17:40					
18:00 – 20:30	Welcome Party (in MARIOS building 20F, Skymetro)				

October 24

	Room 803	Study Room 1	Study Room 2	Study Room 4	Room 501
9:00	Registration Starts				
9:30 – 10:50 / 11:10	Special Session: Security and Privacy in Data-Aware Systems (1) [33] [35] [39] [41]	Special Session: Intuitive Human-System Interaction [12] [13] [21] [23] [53]	General Session 2 [22] [34] [62] [85] [91]	Special Session: Advances on Biomedical Informatics and Engineering for Healthcare (1) [26] [27] [61] [73] [74]	
11:10 – 11:30	Coffee Break (at Room 807)				
11:30 – 12:10		Special Session: The Data Analysis and Intelligent Computing for Awareness Applications (1) [5] [9]	General Session 4 [8] [20]	Special Session: Advances on Biomedical Informatics and Engineering for Healthcare (2) [77] [105]	
12:10 – 13:30	Lunch				
13:30 – 14:30 / 14:50		Special Session: The Data Analysis and Intelligent Computing for Awareness Applications (2) [10] [11] [15] [18]	General Session 5 [37] [94] [120] [126]	Special Session: Disaster Awareness Communication Networks, Systems, and Applications [79] [115] [117]	Special Session: Security and Privacy in Data-Aware Systems (2) [43] [44] [65] [84]
14:50 – 15:20	Coffee Break (at Room 807)				
15:20 – 16:20 / 17:00 / 17:20		Special Session: The Data Analysis and Intelligent Computing for Awareness Applications (3) [30] [42] [46] [59] [101] [132]	General Session 7 [49] [64] [76] [103] [133] [134]	Special Session: Medical Data Analytics [57] [66] [87] [116] [128]	Special Session: Security and Privacy in Data-Aware Systems (3) [92] [113] [118]
19:00 – 21:30	Banquet Dineer (in ART hotel)				

October 25

	Room 803	Study Room 1	Study Room 2	Study Room 4	Room 501
9:00	Registration Starts				
9:30 – 10:30	Keynote 2 [Wen-Liang Hwang]				
10:30 – 11:00	Coffee Break (at Room 807)				
11:00 – 12:00 / 12:20 / 12:40	General Session 8 [32] [48] [58] [80] [96]	General Session 9 [38] [109] [111] [130]	General Session 3 [63] [67] [114]	General Session 6 [50] [122] [123]	
12:40 – 12:50	Closing				

Keynote Speakers

Brain Machine Interface Systems - Translating Thoughts to Actions
Dr. Vinod A Prasad

Oct.23 (Room 803, 10:00-11:00)

Abstract

Brain-Machine Interfaces are systems that translate the user's thoughts (intentions) coded by brain activity measures into actions through a control signal without using activity of any muscles or peripheral nerves. These control signals can potentially be employed to substitute motor capabilities (e.g. brain-controlled prosthetics for amputees or patients with spinal cord injuries, brain-controlled wheel chair); to help in the restoration of such functions (e.g. as a tool for stroke rehabilitation), to enable alternative communication (e.g. virtual keyboard, speller etc.) for those who are disabled or otherwise unable to communicate, and other applications such as serious games for enhancing cognition skills. This talk will provide an overview of Brain-Machine Interface (BMI) Systems, research challenges and applications. The talk will also highlight the importance of the awareness of BMI user about his/her performance through neurofeedback mechanism, which helps in self-regulation for performance enhancement.

Speaker's Biography

Dr. Vinod A Prasad is a Professor in Electrical Engineering Department of IIT Palakkad and the Dean of Industry Collaboration & Sponsored Research. He has 24 years of work experience in industry and academics. Prior to joining IIT Palakkad in October 2017, Dr. Vinod has been a tenured Associate Professor in School of Computer Engineering, Nanyang Technological University (NTU), Singapore.

Vinod's research interests include digital signal processing, low power, reconfigurable circuits & systems for wireless communications, Brain-Computer Interface and its applications. He has on-going and completed external research grants from various funding agencies - Ministry of Education, Singapore, Ministry of Defence, Singapore, DSO National Laboratories, Singapore, European Aeronautic Defence & Space Company, Singapore Millennium Foundation, Civil Aviation Authority of Singapore and Airbus Group Innovations amounting over $3 million as principal investigator. He has published over 240 papers in refereed international journals and international conferences. He has supervised and graduated 15 Ph.D. students and 1 Master of Engineering (By Research) student. Currently, he is guiding 5 Ph.D. students and 3 Post-doctoral Fellows. He is an Associate Editor of IEEE Transactions on Human-Machine Systems, and Associate Editor of Springer Journal of Circuits, Systems & Signal Processing, Senior Member of IEEE and Track Co-Chair (Brain-Machine Interface Systems) of IEEE Systems, Man & Cybernetics Society for which he won the award of the 'Most Active Technical Committee in Human-Machine Systems' of IEEE Systems, Man and Cybernetics Society in three consecutive years – 2015, 2016 and 2017. Vinod has won the Nanyang Award for Excellence in Teaching 2009, the highest recognition conferred by NTU Singapore to individual faculty for teaching.

Signal Representation with Non-Linear Networks
Dr. Wen-Liang Hwang

Oct.25 (Room 803, 9:30-10:30)

Abstract

I consider DNNs with rectified linear units and max-pooling operations from a signal representation perspective. In this view, such representations mark the significant transition from using a single linear representation to utilizing a large collection of affine linear representations tailored to particular regions of the signal space. However, the expression power of a DNN cannot be fully leveraged in signal processing without explicit expressions of the affine linear operators, their domains, ranges, and composition from the weight and bias parameters of the network.

I address the problem and provides a precise description of the individual affine linear representations and corresponding domain regions that the neural network associates to each signal of the input space. In particular, we describe weighted atomic decompositions of the representations and, based on estimating their Lipschitz regularity, draw the connection between the sparse or compressible weight distributions and the stability in representation and learning, independent of the network depth. Such an analysis may facilitate understanding DNNs and promote further theoretical insight from both the signal processing and machine learning communities.

Speaker's Biography

Wen-Liang Hwang received his B.S. Degree in Nuclear Engineering from National Tsing Hua University, Hsinchu, Taiwan; his M.S. Degree in Electrical Engineering from the Poly- technic Institute of New York, New York; and, in 1993, his Ph.D. in Computer Science from New York University, New York. He was a postdoctoral researcher with the Department of Mathematics, University of California, Irvine in 1994. In January 1995, he became a member of the Institute of Information Science, Academia Sinica, Taipei, Taiwan, where he is currently a Research Fellow. He is co-author of the book: "Practical Time-Frequency Analysis," Academic Press, 1998. He is co-author of the ISI high-cited paper in 2008 : "Singularity detection and processing with wavelets". In over 20 years, Dr. Hwang's research covers wavelets, time-frequency analysis, image and video compression, sparse representation and compressive sensing and applications. His current research interests include analysis of deep neural networks and large-scale numerical optimization.

iCAST 2019 Technical Program
October 23

Registration Starts (9:00-)

Opening (Room 803, 9:30-10:00)

Keynote 1: Brain Machine Interface Systems - Translating Thoughts to Actions (Room 803, 10:00-11:00)
Chair: Basabi Chakraborty

Coffee Break (Room 807, 11:00-11:30)

Invited Talk 1 (Room 803, 11:30-12:00)
Glenn Mansfield Keeni and Hiroshi Tsunoda. Security and Privacy Awareness: for Software Creators and Users
Chair: Masafumi Matsuhara

Invited Talk 2 (Room 803, 12:00-12:30)
Hiroshi Yoshiura. Re-identifying people from anonymous histories of their activities
Chair: Masafumi Matsuhara

Lunch (12:30-13:50)

Invited Talk 3 (Room 803, 13:50-14:20)
Peter Burgstaller. Awareness of Privacy and Intellectual Property Rights under the Economic Partnership Agreement between EU and Japan
Chair: Yusuke Manabe

Invited Talk 4 (Room 803, 14:20-14:50)
Toyoo Takata and Kanayo Ogura. Confront Phishing Attacks – from a Perspective of Security Education
Chair: Yusuke Manabe

Coffee Break (Room 807, 14:50-15:20)

General Session 1 (Room 803, 15:20-16:20)
Chair: Vinod A. Prasad

[6] Liu Shuang, Wu Wenyi, Zhai Siyu, Liu Xiaoya, Ke Yufeng, An Xingwei and Ming Dong. Improve the generalization of the cross-task emotion classifier using EEG based on feature selection and SVR

[19] Iman Fahruzi, I Ketut Eddy Purnama, Hideya Takahashi and Mauridhi Hery Purnomo. Classification of Sleep Disorder from Single Lead Non-overlapping of ECG-apnea based Non-Linear Analysis using Ensemble Approach

[112] Prima Dewi Purnamasari, Pratiwi Yustiana and Anak Agung Putri Ratna. Mobile EEG Based Drowsiness Detection using K-Nearest Neighbor

Special Session / IEEE Women in Engineering (WIE): Technologies for Women - The Good, the bad and the ugly (1) (Study Room 1, 13:50-14:50)
Chair: Ramalatha Marimuthu

[70] Sasikala.S, Bharathi M, Ezhilarasi M and Arunkumar S. Breast Cancer Detection Based on Medio-Lateral ObliqueView and Cranio-Caudal View Mammograms: An Overview

[81] Shanthi M, Ramalatha M Marimuthu, Shivappriya S.N. and Navaneethakrishnan R. Diagnosis of Diabetes using an Extreme Learning Machine Algorithm based Model

[82] Dinesh Ramachandran and Dr.Ramalatha Marimuthu. A Survey about WSN and IoT Based Health Care Applications and ADPLL Contribution for Health Care Systems

Special Session / IEEE Women in Engineering (WIE): Technologies for Women - The Good, the bad and the ugly (2) (Study Room 1, 15:20-16:40)
Chair: Ramalatha Marimuthu

[83] Madhusri V, Kesav Krishnan G, Ramalatha Marimuthu and Sathyanarayanan Ramesh. PERFORMANCE COMPARISON OF MACHINE LEARNING ALGORITHMS TO PREDICT LABOR COMPLICATIONS AND BIRTH DEFECTS BASED ON STRESS

[86] Shivappriya S.N, Shanthi M, Kesav Krishnan G, Sathyanarayanan Ramesh and Ramalatha Marimuthu. INFLUENCE OF ILLITERACY ON MATERNAL AND CHILD HEALTH AMONG WOMEN IN INDIA

[108] Alagumeenaakshi Muthiah, Kavitha K, Bharathi M, Ajitha S, Monisha Thangam K S, Viveka Vikram K and Ramalatha Marimuthu. Maternal ehealth Monitoring System using LoRa Technology

[125] Vishesh Sharma, Yati Tomar Tomar and Vydeki D. SMART SHOE FOR WOMEN SAFETY

Special Session / IEEE Women in Engineering (WIE): Panel Discussion / Leaking Pipeline : Sustaining Tech-Aware Women Careers (Study Room 1, 16:40-17:40)
Chair: Basabi Chakraborty

Panelists: Ramalatha Marimuthu, Nabanita Das, Emi Yano
Moderator: Takako Hashimoto

Special Session: Text Mining and Analytics (Study Room 2, 15:20-17:40)
Chair: Saptarsi Goswami

[60] Kushankur Ghosh, Arghasree Banerjee, Sankhadeep Chatterjee and Soumya Sen. Imbalanced Twitter Sentiment Analysis using Minority Oversampling

[68] ianwei Zhang, Taiga Otomo, Lin Li and Shinsuke Nakajima. Cyberbullying Detection on Twitter using Multiple Textual Features

[93] Norifumi Watanabe, Masafumi Matsuhara, Goutam Chakraborty and Hiroshi Mabuchi. Method to Present Situation Aware Suitable Reply Candidate on Mobile Terminal

[97] Yuki Okude, Masafumi Matsuhara, Goutam Chakraborty and Hiroshi Mabuchi. Improving Awareness of Emotional Meaning of Emoticon by Representing as Numelical Vectors

[98] Subha Jyoti Das and Basabi Chakraborty. An Approach for Automatic Aspect Extraction by Latent Dirichlet Allocation

[110] Anirban Mukherjee, Sabyasachi Mukhopadhyay, Prasanta K. Panigrahi and Saptarsi Goswami. Study of recurrent neural networks and Utilization of Oversampling for multiclass sentiment analysis

[127] Shu-Cih Tseng, Yu-Ching Lu, Goutam Chakraborty and Long-Sheng Chen. Comparison of Sentiment Analysis of Review Comments by Unsupervised Clustering of Features Using LSA and LDA

Special Session: Awareness Technology for Economic and Social Data Analysis (Study Room 4, 15:20-17:00)
Chair: Yukari Shirota

[24] Kenji Yamaguchi and Yukari Shirota. Pattern Classification of Disasters Impact on Companies Stock Price

[17] Eina Hashimoto, Masatsugu Ichino and Hiroshi Yoshiura. A Re-Identification Strategy Using Machine Learning that Exploits Better Side Data

[29] Jean Marie Tshimula, Mary M. Njuguna, Thierry Roger Bayala, Mbuyi Mukendi Didier, Achraf Essemlali,

Hugues Kanda and Numfor Solange Ayuni. Sifting for Deeper Insights from Public Opinion: Towards Crowdsourcing and Big Data for Project Improvement]

[131] Akira Kusaba, Tetsuji Kuboyama and Takako Hashimoto. Time Series Electricity Consumption Analysis using Non-negative Matrix Factorization

[135] Kotaro Nakano and Basabi Chakraborty. Effective feature extraction from driving data for detection of danger awareness

Welcome Party (in MARIOS building 20F, Skymetro, 18:00-20:30)

October 24

Registration Starts (9:00-)

Special Session: Security and Privacy in Data-Aware Systems (Room 803, 9:30-10:50)
Chair: Hung-Yu Chien

[33] Takumi Saito, Zhao Qiangfu and Hiroshi Naito. Second Level Steganalysis - Secret Data Position Prediction Based on Machine Learning

[35] Chin-Feng Lee, Jau-Ji Shen, Yi-Jhen Wu and Somya Agrawal. Reversible Data Hiding Scheme based on Difference Expansion using Shiftable Block Strategy for Enhancing Image Fidelity

[39] Tzu-Chuen Lu, Jau-Ji Shen and Ting-Chi Chang. Effective Dual-images based Reversible Information Hiding Scheme based on Complexity Analysis and Thresholds Controlling

[41] Hung-Yu Chien, Guo-Hao Qiu, Jian Fu Liao, Ruo-Wei Hung, An-Tong Shih and Chunhua Su. Hierarchical MQTT with Edge Computation

Special Session: Intuitive Human-System Interaction (Study Room 1, 9:30-11:10)
Chair: Masao Yokota

[12] Naoto Iwahashi. Equilibrium Predictive Control Based on Mutual Belief Hierarchy for Autonomous Driving

[13] Hiroshi Takenouchi and Masataka Tokumaru. Interactive Evolutionary Computation System Using Multiple Users' Gaze Information Considering User's Partial Evaluation Participation

[21] Yushi Machidori, Ko Takayama and Kaoru Sugita. Implementation of multi-modal interface for VR application

[23] Itaru Takayashiki, Akio Doi, Tour Kato, Hiroki Takahashi, Syoto Sekimura, Maiko Hozawa and Yoshihiro Morino. Automatic segmentation of left atrial appendage area using heart CT images

[53] Naoto Iwahashi. Physics Projection

General Session 2 (Study Room 2, 9:30-11:10)
Chair: Goutam Chakraborty

[22] Pattaramanee Arsomngern, Nichakorn Numcharoenpinij, Jitpinun Piriyataravet, Wutiwong Teerapan, Woranich Hinthong and Phond Phunchongharn. Computer-Aided Diagnosis for Lung Lesion in Companion Animals from X-ray Images Using Deep Learning Techniques

[34] Thanat Lapthawn and Santitham Prom-On. Acoustic-to-Articulatory Inversion of a Three-dimensional Theoretical Vocal Tract Model using Deep Learning-based Model

[62] Intouch Kunakorntum, Woranich Hinthong, Sumet Amonyingchareon and Phond Phunchongharn. Liver Cancer Prediction using Synthetic Minority based on Probabilistic Distribution (SyMProD) Oversampling Technique

[85] Yuki Mori, Hirosato Seki and Masahiro Inuiguchi. Knowledge Acquisition with Deep Fuzzy Inference Model and Its Application to a Medical Diagnosis

[91] Keigo Yabuki and Kaoru Sumi. Ambiguous Utterance Aware: Communication Learning System for Pragmatic Language Disorders Using a Humanoid Robot

Special Session: Advances on Biomedical Informatics and Engineering for Healthcare (1)
(Study Room 4, 9:30-11:10)
Chair: Ying Chen

[26] Peng Cui, Zhe Guo, Jianbo Xu, Tianhui Li and Wenxi Chen. Recognition of Nerve and Dura Mater in Spinal Endoscopic Images Using Deep Learning

[27] Jianbo Xu, Tianhui Li, Peng Cui and Wenxi Chen. Improvement of ECG based Personal Identification Performance In Different Bathtub Water Temperature By CNN

[61] Kavitha Thomas, Neethu Robinson and Vinod A P. Utilizing Subject-Specific Discriminative EEG Features for Classification of Motor Imagery Directions

[73] Zunyi Tang, Ying Chen, Shing-Hong Liu, Toshio Kobayashi and Wenxi Chen. Continuous Cuffless Blood Pressure Estimation Based on Pulse Transit Time: A New Evaluation with Invasive BP Reference

[74] S.M. Isuru Niroshana, Xin Zhu, Ying Chen and Wenxi Chen. Sleep Stage Classification Based on EEG, EOG, and 4-stage Deep Learning Model

Coffee Break (Room 807, 11:10-11:30)

Special Session: The Data Analysis and Intelligent Computing for Awareness Applications (1)
(Study Room 1, 11:30-12:10)
Chair: Long-Sheng Chen

[5] Ruo-Wei Hung. Finding Longest (s, t)-paths of O-shaped Supergrid Graphs in Linear Time

[9] Shu-Ching Wang, Yu-Ling Lin and Hung-Hsuan Wang. Quality Enhancement of P2P using Interested Clusters in the P4P Architecture

General Session 4 (Study Room 2, 11:30-12:10)
Chair: Yusuke Manabe

[8] Zitong Wang and Yan Pei. A Study on Multi-objective Chaotic Evolution Algorithms Using Multiple Chaotic Systems

[20] Zhongda Liu, Takeshi Murakami, Satoshi Kawamura and Hitoaki Yoshida. Parallel Implementation of Chaos Neural Networks for an Embedded GPU

Special Session: Advances on Biomedical Informatics and Engineering for Healthcare (2)
(Study Room 4, 11:30-12:10)
Chair: Ying Chen

[77] Rima Tri Wahyuningrum, Lilik Anifah, I Ketut Eddy Purnama and Mauridhi Hery Purnomo. A New Approach to Classify Knee Osteoarthritis Severity from Radiographic Images based on CNN-LSTM Method

[105] Tianhui Li, Jianbo Xu, Peng Cui and Wenxi Chen. The Effect of Stress on Optimal Bathing Time

Lunch (12:10-13:30)

Special Session: The Data Analysis and Intelligent Computing for Awareness Applications (2)
(Study Room 1, 13:30-14:50)
Chair: Rung-Ching Chen

[10] Shu-Ching Wang, Yu-Ling Lin and Chan-Grong Dai. Use Product Segmentation to Enhance the Competitiveness of Enterprises in the IoT

[11] Shu-Ching Wang, Wei-Shu Hsiung and Yi-Syuan Lin. The Data Analysis for the Influence of Cross-cultural Training on the Adaptability of Foreign Workers

[15] Shao Kuo Tai and Yujen Kuo. Alterations in brainwaves caused by different Music Genres

[18] Christine Dewi, Rung-Ching Chen, Hendry Hong and Yan-Ting Liu. Similar Music Instrument Detection via Deep Convolution YOLO-Generative Adversarial Network

General Session 5 (Study Room 2, 13:30-14:50)
Chair: Toyoo Takata

[37] Pravee Kruachottikul, Nagul Cooharojananone, Gridsada Phanomchoeng, Thira Chavarnakul, Kittikul Kovitanggoon, Donnaphat Trakulwaranont and Kanokwan Atchariyachanvanich. Bridge Sub Structure Defect Inspection Assistance by using Deep Learning

[94] Truong Quang Tung, Huyen Thi Thanh Tran and Truong Cong Thang. Non-reference Quality Assessment Model using Deep learning for Omnidirectional Images

[120] Cheng-Hsiung Hsieh. Dehazed Image Enhancement by a Gamma Correction with Global Limits

[126] Wei-Hsiang Chung, Goutam Chakraborty, Rung-Ching Chen and Cédric Bornand. Object Dynamics from Video Clips using YOLO Framework

Special Session: Disaster Awareness Communication Networks, Systems, and Applications (Study Room 4, 13:30-14:30)
Chair: Yoshitaka Shibata

[79] Ko Takayama, Yushi Machidori and Kaoru Sugita. Implementation of a Quality Measurement Software for Virtual Reality Content on a head mount display

[115] Noriki Uchida, Kanji Nakano, Chiho Takegawa, Tomoyuki Ishida and Yoshitaka Shibata. Proposal on the Disaster Information System based on QoS Controls of Heterogenious Radio Networks and Radio Atomosphere

[117] Akira Sakuraba, Yoshitaka Shibata and Toshihiro Tamura. Evaluation of Performance on LPWA Network Realizes for Multi-wavelength Cognitive V2X Wireless System

Special Session: Security and Privacy in Data-Aware Systems (2) (Room 501, 13:30-14:50)
Chair: Hung-Yu Chien

[43] Jau-Ji Shen, Chin-Feng Lee, Yen-Hsi Li and Somya Agrawal. Image Steganographic Scheme Based on Double-layer Magic Matrix

[44] Hung-Yu Chien, An-Tong Shih and Y. M. Tseng. Exploration of Fast Edible Oil Classification Using Infrared Spectrum, Machine Learning, and Chemometrics

[65] Yu-Chun Chung, Jia-Hao Ou and Justie Su-Tzu Juan. Fault-Tolerant Visual Secret Sharing Scheme Using Meaningful Shares

[84] Chia-Mei Chen, Dan-Wei Marian Wen, Jun-Jie Fang, Gu-Hsin Lai and Yi-Hung Liu. A Study on Security Trend based on News Analysis

Coffee Break (Room 807, 14:50-15:20)

Special Session: The Data Analysis and Intelligent Computing for Awareness Applications (3) (Study Room 1, 15:20-17:20)
Chair: Ruo-Wei Hung

[30] Satoshi Kawamura, Zhongda Liu and Hitoaki Yoshida. Estimation of the Kansei Information obtained from Musical Scores via Machine Learning Algorithms

[42] Long-Sheng Chen and Ying-Jung Chuan. A Study of Social Media Reviews Effects on the Success of Crowdfunding Projects

[46] Nagul Cooharojananone, Orawun Moolpun, Pitchapa Pawong, Jidapa Dilokpabhapbhat, Thanaporn Rimnong-Ang, Manutsaya Choosuwan, Pattamon Bunram and Suporn Pongnumbkul. A Study of Influences of Social Network Awareness on MOOC Learner Behaviors: Case of Chulalongkorn University Free MOOC

[59] Diana Purwitasari, Chastine Fatichah, Adri Gabriel Sooai, Surya Sumpeno and Mauridhi Hery Purnomo.

Productivity-based Features from Article Metadata for Fuzzy Rules to Classify Academic Expert

[101] Shih-Hung Wu and Chun-Yu Yeh. A Short Answer Grading System in Chinese by CNN

[132] Shoichi Ichimura and Qiangfu Zhao. Detection of suspicious route by classification of ships based on machine learning

General Session 7 (Study Room 2, 15:20-17:20)
Chair: Yusuke Manabe

[49] Arnab Kumar Ghoshal, Nabanita Das and Soham Das. Misinformation Containment in OSNs leveraging Community Structure

[64] Purimpat Cheansunan and Phond Phunchongharn. Detecting Anomalous Events on Distributed Systems Using Convolutional Neural Networks

[76] Muhammad Salman, Nindya Viani and Diyanatul Husna. Static Analysis Method on Portable Executable Files for REMNUX based Malware Identification

[103] Pinnaree Kureerung and Lachana Ramingwong. A Framework for Usability Design to Promote Awareness of Information Disseminated via Mobile Government Applications

[133] Yuching Lu and Goutam Chakraborty. Definition and Goal of Graph Clustering - Motivation to Explore a New Algorithm

[134] Tastuya Arai and Basabi Chakraborty. Selection of Effective Features for BGP Anomaly Detection

Special Session: Medical Data Analytics (Study Room 4, 15:20-17:00)
Chair: Keun Ho Ryu

[57] Weilun Wang and Goutam Chakraborty. Deep Learning for Automatic Identification of Nodule Morphology Features and Prediction of Lung Cancer

[66] Cedric Bornand, Angelika Güsewell, Alexia Stantzos, Emilie Bovet, Gilles Bangerter and Bertrand Hochet. Engineering for psychiatry: a case study

[87] Khishigsuren Davagdorj and Keun Ho Ryu. A machine-learning approach for predicting success in smoking cessation intervention

[116] ongjun Piao, Kwang Ho Park, Keun Ho Ryu and Rong Xiang. Identification of DNA Methylation Signatures for Diagnosis of Lung Adenocarcinoma

[128] Jija Dasgupta and Bhabatosh Chanda. NOVEL FEATURES FOR DIAGNOSIS OF PARKINSON'S DISEASE FROM OFF-LINE ARCHIMEDEAN SPIRAL IMAGES

Special Session: Security and Privacy in Data-Aware Systems (3) (Room 501, 15:20-16:20)
Chair: Hung-Yu Chien

[92] Zhaoyang Han, Chunhua Su, Shuxue Ding, Huakun Huang and Lingjun Zhao. Device-Free Localization via Sparse Coding with Log-Regularizer

[113] Chia-Mei Chen, Shi-Hao Wang, Dan-Wei Wen, Gu-Hsin Lai and Ming-Kung Sun. Applying Convolutional Neural Network for Malware Detection

[118] Hiroshi Naito and Qiangfu Zhao. A New Steganography Method Based on Generative Adversarial Networks

Banquet Dinner (in ART Hotel, 19:00-21:30)

October 25

Registration Starts (9:00-)

Keynote 2: Signal Representation with Non-Linear Networks (Room 803, 9:30-10:30)
Chair: Goutam Chakraborty

Coffee Break (Room 807, 10:30-11:00)

General Session 8 (Room 803, 11:00-12:40)
Chair: Yutaka Watanobe

[32] Sevendi Eldrige Rifki Poluan and Yan-Ann Chen. Using Smart Insoles and RGB Camera for Identifying Stationary Human Targets

[48] Ryo Ota, Tatsuya Hanyu and Qiangfu Zhao. Indoor Location Estimation of a Moving Subject Based on a Simple Motion Sensor Array

[58] Kohei Suzuki, Haruki Igarashi, Yusuke Manabe and Kenji Sugawara. A Development of Ad-hoc Smart Room Based on User-oriented Context-aware System Architecture

[80] Benying Tan, Xiang Li, Shuxue Ding, Yujie Li, Shotaro Akaho and Hideki Asoh. A Novel Maximum-Likelihood Detection for the Binary MIMO System Using DC Programming

[96] Yutaka Watanobe, Yuichi Yaguchi, Toshimune Miyaji, Ryuhei Yamada and Keitaro Naruse. Data Acquisition Framework for Cloud Robotics

General Session 9 (Study Room 1, 11:00-12:20)
Chair: Nabanita Das

[38] Intisar Chowdhury and Qiangfu Zhao. A Selective Modular Neural Network Framework

[109] Anak Agung Putri Ratna, Fransiskus Astha Ekadiyanto, Ihsan Ibrahim and Fathimah Rahimullah. Investigating Parallelization of Cross-language Plagiarism Detection System Using the Winnowing Algorithm in Cloud Based Implementation

[111] Anak Agung Putri Ratna, Lea Santiar, F. Astha Ekadiyanto, Prima Dewi Purnamasari, Ihsan Ibrahim, Dyah Lalita Luhurkinanti and Adisa Larasati. Latent Semantic Analysis and Winnowing Algorithm Based Automatic Japanese Short Essay Answer Grading System Comparative Performance

[130] Shuang Li and Jun Sasaki. A Study on the Tourism Features Extraction from Photos in a Tourism Website by Image Analysis

General Session 3 (Study Room 2, 11:00-12:00)
Chair: Qiangfu Zhao

[63] Jheng-Long Wu, Chi-Sheng Yang, Kai-Hsuan Liu and Min-Tzu Huang. A Deep Learning Model for Dimensional Valence-Arousal Intensity Prediction in Stock Market

[67] Thammasorn Harnpadungkij, Warasinee Chaisangmongkon and Phond Phunchongharn. Risk-Sensitive Portfolio Management by using Distributional Reinforcement Learning

[114] Yi Chen Shiao, Goutam Chakraborty, Shin Fu Chen, Li Hua Li and Rung Ching Chen. Modeling and Prediction of Time-Series - A Case Study with Forex Data

General Session 6 (Study Room 4, 11:00-12:00)
Chair: Diana Purwitasari

[50] Hidetoshi Ito and Basabi Chakraborty. A Proposal for Shape Aware Feature Extraction for Time Series Classification

[122] Ashis Kumar Mandal, Rikta Sen and Basabi Chakraborty. Binary Owl Search Algorithm for Feature Subset Selection

[123] Rikta Sen, Ashis Kumar Mandal, Saptarsi Goswami and Basabi Chakraborty. A Comparative Study of the Stability of Filter based Feature Selection Algorithms

Closing (Room 803, 12:40-12:50)

iCAST 2019 Paper Abstracts

October 23

Invited Talk 1: Security and Privacy Awareness: for Software Creators and Users

Glenn Mansfield Keeni and Hiroshi Tsunoda

11:30-12:00 (Room 803)

Information technology (IT) has far-reaching impact on society. Its security and privacy aspects are now under intense scrutiny. In this work we examine how we got where we are today. We focus on the Internet and related applications and review its evolution. We show that there was lack of security awareness among the innovators. The technology and its applications grew with minimal regulations, unfettered. When technical security awareness dawned for engineers and knowledgeable folks, users at large either remained unaware or they could not be weaned from the attractive and easy to use insecure applications. Without enough social awareness of the implications of the Internet based tools and systems, the Networked Society now has gigantic pools of information most of it without much protection for security and privacy. We discuss the importance of social checks and balances to ameliorate the situation. Index Terms—Internet Security, Security and Privacy, Security awareness.

Invited Talk 2: Re-identifying people from anonymous histories of their activities

Hiroshi Yoshiura

12:00-12:30 (Room 803)

Privacy problems are major obstacles to collecting and using big data because, in many cases, big data reflects a person's history of activities, such as moving around a city, buying goods, surfing the Web, and posting content on social media. Although anonymization is an effective technical measure for alleviating privacy concerns, we must be aware of two problems that could infringe privacy: re-identifying the people represented by the data despite anonymization and profiling people from the data. In this paper, we first survey reidentification techniques developed for various areas, clarify the relationship between re-identification and profiling, and mathematically model the re-identification problem. We then present methods for re-identifying social media accounts and location histories and present the results of evaluations demonstrating their effectiveness.

Invited Talk 3: Awareness of Privacy and Intellectual Property Rights under the Economic Partnership Agreement between EU and Japan

Peter Burgstaller

13:50-14:20 (Room 803)

Only as recent as on February 1st, 2019 the Economic Partnership between the EU and Japan entered into force. The new agreement will give consumers greater choice and cheaper price. It will not only protect property rights for great European and Japanese products, both in Japan and EU, such as the Austrian "Tiroler Speck" or "Kobe Beef", but also allow personal data to flow freely and safely protected between the two partners. The agreement moreover defines that the parties of the agreement are obliged to grant and ensure intellectual property rights such as copyrights, trademarks, designs or patents and provide proceedings against infringer of such rights, including counterfeiting and piracy. This, of course, extends to IT and software goods and services. Awareness of the details of such an agreement is a necessity for both creators and users of such products because awareness of such legal frameworks is a precondition for legal compliance. This work tries to promote an awareness of the intricate nuances of such agreement for software practitioners who do not have any legal background.

Invited Talk 4: Confront Phishing Attacks – from a Perspective of Security Education

Toyoo Takata and Kanayo Ogura

14:20-14:50 (Room 803)

Recently, targeted attacks are drastically increasing in both indivduals and companies. For technical countermeasure against such a targeted attack, various methods such as email/web contents analysis etc., are developed and realized. However, as it is often said, attackers precisely exploit the most vulnerable part in order to achieve their goals. Therefore, spear phishing against human user is employed for such attacks in a large propotion. Moreover, in order to increase success probability of such attacks, attackers often adopt social engineering technique. In this paper, we present a current effort of our research group on combating targeted attacks employing spear phishing with using social engineering, through user education. Specifically, at first we present relationship between human psychological characteristics and vulnerability against social engineering. The result can be used for testing whether a user has vulnerability on some social engineering technique, and the testing result can be utilized for countermeasure or user's training. Secondly, we present development of a web-based self learning material for countermeasure against social engineering which employs interactive motion picture contents.

General Session 1

15:20-16:20 (Room 803)

[6] Improve the generalization of the cross-task emotion classifier using EEG based on feature selection and SVR

Liu Shuang, Wu Wenyi, Zhai Siyu, Liu Xiaoya, Ke Yufeng, An Xingwei and Ming Dong

Emotion is a state that comprehensively represents human feeling, thought and behavior. In our daily life, emotion has played an increasingly important role, and emotion recognition has become a research focus. What' more, the application has a broader perspective at home and abroad. Most existing studies identified emotion under specific tasks, but emotion classifiers are required to

recognize emotion under any conditions in practice. Therefore, cross-task emotion recognition is a necessary step to move from the laboratory to the practical use. In this work, we designed three different induced tasks, picture-induced, music-induced and video-induced tasks. 13 (8 females and 5 males) participants were recruited and evoked to be positive, neutral and negative states respectively. The results using support vector regression highlighted that the correlation coefficient was higher for inter-task classification in video-induced and music-induced tasks, while deteriorated significantly in cross-task classification. Combining recursive feature screening and support vector regression to optimize features, the optimal feature set had better performance than all features employed, obtaining above 0.8 for correlation coefficient. These results indicated that SVR could achieve a better performance of cross-task emotion recognition, partly because it avoided the problem of emotion intensity mismatch in different tasks.

[19] Classification of Sleep Disorder from Single Lead Non-overlapping of ECG-apnea based Non-Linear Analysis using Ensemble Approach

Iman Fahruzi, I Ketut Eddy Purnama, Hideya Takahashi and Mauridhi Hery Purnomo

The most significant determinant of quality of life is sleep quality, with better sleep resulting in a healthier and longer life. Polysomnography, or PSG, is a standardized system to get the medical recording from a multi-lead ECG record. However, PSG is a complex, expensive and time-consuming procedure. Other alternatives include home sleep center (HSC) development as a tool for early diagnosis and prevention of sleep disorders while keeping high accuracy. HSC uses low-cost equipment by utilizing single-lead ECG and accompanying applications. Electrocardiogram (ECG) is one of the media used in diagnosing and analysis of medical information related to sleep disorders. This study aims to develop a computerized sleep diagnosis application to help experts classify symptoms by investigation and evaluation of QRS morphological, time-frequency characteristics, and nonlinear analysis from single-lead ECG recordings. The Sleep disorder classification utilizes single lead non-overlapping of ECG-apnea based on nonlinear assessment and ensemble method. The ensemble learning approach, using the Boosted Tree test, yielded an accuracy of 94.7%, prediction speed of 120 obs/s and training time of 2.374 s. The QRS morphological characteristic and improved non-overlapping ECG recordings provided satisfactory diagnostic performance in sleep disorder classification for HSC usage.

[112] Mobile EEG Based Drowsiness Detection using K-Nearest Neighbor

Prima Dewi Purnamasari, Pratiwi Yustiana and Anak Agung Putri Ratna

In this research, a drowsiness detection system, named Drowsiver, was developed for a mobile electroencephalograph (EEG) and a mobile phone. The system is expected to minimize the causes of accidents that caused by drowsy drivers. By using Electroencephalogram (EEG), the condition of drowsiness can be detected by recording the electrical activity that occurs in human brain and represented as a frequency signal. Then the signal will be sent to the Android application via Bluetooth and will give an alarm notification if the drowsiness is detected. The brainwave from the mobile EEG will be processed using Fast Fourier Transform (FFT) to extract features in human brain signals and be classified using K-Nearest Neighbor (KNN) classifier. The results obtained from the developed system indicate that the application can produce the best performance with the highest accuracy of 95.24% using the value of K=3 and by using 4 brain waves as features, namely Delta, Theta, Alpha, and Beta waves.

Special Session / IEEE Women in Engineering (WIE): Technologies for Women - The Good, the bad and the ugly (1)

13:50-14:50 (Study Room 1)

[70] Breast Cancer Detection Based on Medio-Lateral ObliqueView and Cranio-Caudal View Mammograms: An Overview

Sasikala.S, Bharathi M, Ezhilarasi M and Arunkumar S

Breast cancer is a leading cause of death among women. At the early stage, no obvious symptoms were identified in breast cancer patients. Accurate detection of breast cancer at the earliest stage is very much essential to reduce mortality. Mammography has been used as a gold standard for over 40 years in diagnosing breast diseases. Interpretation of suspiciousregions in screening mammograms is a subjective measure which depends on the image quality and the radiologist's experience. Computer Aided Detection (CAD) systems are developed as an alternative to assist radiologist and clinicians in reliable and accurate diagnosis. Cranio-Caudal (CC) view and Medio-Lateral Oblique (MLO) view are commonly used for breast cancer detection and diagnosis.

[81] Diagnosis of Diabetes using an Extreme Learning Machine Algorithm based Model

Shanthi M, Ramalatha M Marimuthu, Shivappriya S.N. and Navaneethakrishnan R

Diabetes is a disorder caused by an increase in blood glucose levels due to insulin secretion deficiency (type 1 diabetes) or impaired insulin activity (type 2 diabetes). More than 90% of people with this condition are diagnosed with type 2 diabetes. Diabetes is now the leading cause of blindness, end-stage renal failure, non-traumatic limb amputations, heart disease, and stroke. Due to the high prevalence of type 2 diabetes in recent years, the prognosis and early diagnosis of the disease have gained much importance. In this paper a study on the types of diabetes is made and a model is proposed and developed for diagnosis of type 2 diabetes using Extreme Learning Machine (ELM) method.

[82] A Survey about WSN and IoT Based Health Care Applications and ADPLL Contribution for Health Care Systems

Dinesh Ramachandran and Dr.Ramalatha Marimuthu

Technology supported health care applications have seen a rapid growth in numbers due to the development of wireless sensor monitoring systems, low power consumption based systems, compact and non complex designs. The huge data thus collected can be transferred easily with the Internet of Things based applications. The impact of these developments on the women health care monitoring systems has resulted in accurate prediction and rapid monitoring of the status of the fetus for the pregnant women. In this paper, the various wireless sensor and IoT based healthcare systems, algorithms used for delay reduction and power reduction, authentication schemes and encryption algorithms related to reliability and security issues and various communication protocols related to the heath care applications are analyzed. A novel ADPLL based system for improving the security and efficiency while reducing the power of the health care applications is proposed.

Special Session / IEEE Women in Engineering (WIE): Technologies for Women - The Good, the bad and the ugly (2)

15:20-16:40 (Study Room 1)

[83] PERFORMANCE COMPARISON OF MACHINE LEARNING ALGORITHMS TO PREDICT LABOR COMPLICATIONS AND BIRTH DEFECTS BASED ON STRESS

Madhusri V, Kesav Krishnan G, Ramalatha Marimuthu and Sathyanarayanan Ramesh

Stress affects physical as well as the mental health of the people and it follows that the stress is one of the major reasons behind the complications during pregnancy like hypertension. Hence it is necessary to ascertain the effects of stress on the health of the mother as well as the baby to find possible complications during pregnancy and delivery. It may also be useful to predict and avoid birth defects since there have been many instances where complications during the delivery have been known leading to cognitive disorders in the child. It follows that the complications during delivery may be stress related. The goal of this study is to design and develop a prediction model for stress-based complications during pregnancy, based on the Physical, Social, Environmental and Biological factors and . For this the dataset was generated using personalized interview-based survey administered to women who have undergone pregnancy and delivery in the past. The questions were based on the factors mentioned above. The data generated is used to check the correctness of the hypothesis and to evaluate the performance of the proposed stress prediction model using different machine learning algorithms like Support Vector Machine (SVM), Naive Bayes (NB), K-Nearest Neighbor (KNN) and Decision Tree (DT). The experimental results proved that the proposed model achieved an accuracy of 90% when Naive Bayes algorithm was used. The other algorithms produced lesser results but still close.

[86] INFLUENCE OF ILLITERACY ON MATERNAL AND CHILD HEALTH AMONG WOMEN IN INDIA

Shivappriya S.N, Shanthi M, Kesav Krishnan G, Sathyanarayanan Ramesh and Ramalatha Marimuthu

Women education is important for the purpose of educating the next generation. This is something realized by the society and governments long back. But even to create the next generation women literacy plays a very strong role, according to the data. Illiteracy leads to less knowledge in healthcare, which causes complication in the pregnancy, leading in some cases to still birth. This study mainly focuses on the relationship between the Literacy rate, Anaemia (poor nutrition causes low red blood cell) prevalent in the pregnant women, how these factors influence the complications during labor and how it affects the health of the new born. The results show that there is a strong correlation between education for women and health care, especially in keeping up with the pregnancy related requirements.

[108] Maternal ehealth Monitoring System using LoRa Technology

Alagumeenaakshi Muthiah, Kavitha K, Bharathi M, Ajitha S, Monisha Thangam K S, Viveka Vikram K and Ramalatha Marimuthu

Out of the multiple emerging Wireless Communication Technologies for IoT applications, LoRaWAN projects a significant role with its specific advantages such as low power, long range communication protocol enabling large scale wireless networks with single hop. This paper presents the application of LoRA technology in ehealthcare, especially for maternity and neonatal care. The Proposed System interfaces the Maternal Monitoring System (MMS) and Traffic Monitoring System (TMS) using a LoRa Gateway to support the reduction in Maternal Death Rate. The MMS available in the ambulance measures the vital parameters of a maternal woman such as body temperature, pressure, glucose level, pulse rate and movement of the fetus and are communicated to the hospital for the pre-planning of labour/emergency ward according to patient's conditions. In the meantime, regulation of traffic in the stipulated path to the hospital is also ensured. The performance of the system is evaluated and reported for real time execution.

[125] SMART SHOE FOR WOMEN SAFETY

Vishesh Sharma, Yati Tomar Tomar and Vydeki D

The world needs to be concerned about the women around and treat them the way they deserve to be treated. Despite having so many laws for women, it doesn't stop thieves, assaulters or molesters to abuse women. This paper suggests a smart shoe that not only helps women take care of themselves but also help them be fearless. This project makes use of GPS, GSM modules, a shock circuit and camera, that are interfaced with Raspberry Pi board and Arduino. Women facing any troubles or in any kind of danger, can immediately make use of this device, embedded in their shoe to escape from the dangerous situation and even harm the attacker.

Special Session / IEEE Women in Engineering (WIE): Panel Discussion

16:40-17:40 (Study Room 1)

Special Session: Text Mining and Analytics

15:20-17:40 (Study Room 2)

[60] Imbalanced Twitter Sentiment Analysis using Minority Oversampling

Kushankur Ghosh, Arghasree Banerjee, Sankhadeep Chatterjee and Soumya Sen

Micro-Blogging platforms have become one of the popular medium which reflects opinion/sentiment of social events and entities. Machine learning based sentiment analyses have been proven to be successful in finding people's opinion using redundantly available data. However, current study has pointed out that the data being used to train such machine learning models could be highly imbalanced. In the current study live tweets from Twitter have been used to systematically study the effect of class imbalance problem in sentiment analysis. Minority oversampling method is employed here to manage the imbalanced class problem. Two well-known classifiers Support Vector Machine and Multinomial Naïve Bayes have been used for classifying tweets into positive or negative sentiment classes. Results have revealed that minority oversampling based methods can overcome the imbalanced class problem to a greater extent.

[68] Cyberbullying Detection on Twitter using Multiple Textual Features

ianwei Zhang, Taiga Otomo, Lin Li and Shinsuke Nakajima

Due to the spread of PCs and smartphones and the rise of user-generated content in social networking service, cyberbullying is also increasing and has become a serious risk that social media users may encounter. In this paper, we focus on the Japanese text on Twitter and construct an optimal model for automatic detection of cyberbullying by extracting multiple textual features and investigating their effects with multiple machine learning models. The experimental evaluation shows that the best model with predictive textual features is able to obtain an accuracy of over 90%.

[93] Method to Present Situation Aware Suitable Reply Candidate on Mobile Terminal

Norifumi Watanabe, Masafumi Matsuhara, Goutam Chakraborty and Hiroshi Mabuchi

In recent years, the number of users using a mobile terminal such as a smart phone and a small mobile terminal such as a smart watch is increasing. In addition, SNS users are increasing year by year. Therefore, necessity for creating messages on a mobile terminal through SNS is increasing. Since the operation screen is small on a mobile terminal, keys for character input are small. Therefore, creating a message on a mobile terminal takes time and typos are common. In particular, when creating a reply after receiving a message via SNS on a small mobile terminal, it may be difficult to respond quickly. Smooth communication between users may not be possible. We have proposed a method to present multiple relevant situation-aware reply candidates to the user corresponding to different situations according to the topic of the received sentence. By the proposed method, the user can select an appropriate reply without performing character input and message revision. The purpose of our proposed method is to support smooth communication between users. The system collects tweets to present a reply candidate. The collected tweets are divided into sentences. Tweets are often written in spoken language on variety of topics. Since the collected tweets may contain noise that is not appropriate as a reply, only suitable tweets are presented to the user as reply candidates by clustering and scoring them. The sentences are divided into different situations by clustering. The sentences with the highest score from each class is presented as a candidate reply. Since the proposed reply indicates different situations, it is expected that most of the time a suitable reply candidate will be presented to the user.

[97] Improving Awareness of Emotional Meaning of Emoticon by Representing as Numelical Vectors

Yuki Okude, Masafumi Matsuhara, Goutam Chakraborty and Hiroshi Mabuchi

In recent years, the internet has spread exponentially. The message exchange using texts prevails in SNS such as Twitter or LINE using a smartphone. In SNS, we can not see the other person's face or gesture. We have to read all the information from the text only such as the other person's emotions and the meaning hidden in sentences. Japanese language and culture is highly context sensitive with many abstract expressions. If we use only text, it may transmit a different meaning from the true intention. In SNS, emoticons are frequently used as means to express emotions that can not be transmitted by text alone. Emotions of sentences can be better understood by analyzing emotions of emoticons. Types of emoticons have increased with the spread of SNS. Therefore, it is difficult to list and grasp the meaning of all currently confirmed emoticons. In this research, emoticon vectors are acquired by learning SNS contents using word2vec. The purpose is to analyze the emotions of unknown emoticons using emoticon vectors. Word2vec can learn the relationship between words

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from a text corpus, and convert the meaning of a word into a vector. In this reseach, classification experiments are performed using the semantic vectors of emoticons calculated by word2vec. The effectiveness of clustering is described from the result of experiments.

[98] An Approach for Automatic Aspect Extraction by Latent Dirichlet Allocation

Subha Jyoti Das and Basabi Chakraborty

Now a days internet has taken over all form of communication and activities. One of the most affected area is e-commerce which survives through internet. One of the vital process of business survival is customer feedback. There are several form of platforms where the feedbacks can be posted. The main task is to accumulate all the reviews and summarize them in a conceivable manner. The approach here is to summarize the reviews in aspect based manner. This representation will help future consumers to make well informed decision. LDA is one of the popular methods to extract latent topics comprising a document. The present approach intends to use that characteristic to extract aspects from review corpora. The current scope of work is to extract and improve the quality of topics. After several corpora of product reviews were processed through this method, the results were examined through graphically plotting the topics and also examining the dominant keywords of the topics. Finally the accumulated results of the present method are compared with the results of previously implemented Word2Vec based model and human extracted aspects.

[110] Study of recurrent neural networks and Utilization of Oversampling for multiclass sentiment analysis

Anirban Mukherjee, Sabyasachi Mukhopadhyay, Prasanta K. Panigrahi and Saptarsi Goswami

Sentiment Analysis is a major element in Artificial Intelligence. Its applications include machine translation, text analysis, computational linguistics, etc. In most cases, classification of sentiment is done into two or three classes. But in some situations, for example rating a product from Amazon, there are multiple classes. One major challenge in such tasks is the class imbalance which reduces the accuracy by making the model biased. To deal with this problem, we use oversampling to reduce the class imbalance of the dataset before training the model. In this research work, first we use variations of recurrent neural networks, such as simple RNN, GRU, LSTM and Bidirectional LSTM, to find out which model performs the best in multi-class classification of sentiment. Then, we use that model to understand the effect of oversampling a dataset before using it to train a model.

[127] Comparison of Sentiment Analysis of Review Comments by Unsupervised Clustering of Features Using LSA and LDA

Shu-Cih Tseng, Yu-Ching Lu, Goutam Chakraborty and Long-Sheng Chen

Text documents could be classified using words as features. As the number of words in the vocabulary is large, the dimension of the document space will be very high. In that case, the feature vector for a document is too long, and very sparse, and it makes clustering and classification algorithms fail. There are various ways to reduce this dimension. In this work, we used Latent Semantic Analysis (LSA), which is actuated by Singular Value Decomposition (SVD). After SVD, we have a compact representation of the documents, which are clustered. In a separate experiment, we did topic modeling using Latent Dirichlet Allocation (LDA). In this initial work, our premise is that comments are of two categories, positive and negative. We cluster the document, in the reduced

dimensional space, into two, using K-means clustering. After dimension reduction by LSA and LDA, the ground truth for documents in two clusters was verified manually, and the results compared. In this work, we used tourists' comments as documents. Tourists visit to a place is influenced by comments from previous visitors. Our final goal is to extract factors that lead to positive comments and those leading to negative comments. That would help promoting tourist business by focusing on the factors that really matters for the customers.

<div align="right">Page 419 in Proceedings</div>

Special Session: Awareness Technology for Economic and Social Data Analysis

15:20-17:00 (Study Room 4)

[24] Pattern Classification of Disasters Impact on Companies Stock Price

<div align="right">Kenji Yamaguchi and Yukari Shirota</div>

We shall estimate the US-China trade friction impact in May 2019 on Japanese companies' stock prices. When the disaster happened, the stock prices drastically decreased. We shall find damaged patterns of the stock price movement. Japanese manufacturing companies have a lot of transactions with Chinese companies. On the other hand, Japanese products such as baby items, cosmetics, and clothing are a lot sold in China. We finally found the latter type B2C based companies showed the quick recovery pattern on their stock price movement in May 2019.

<div align="right">Page 229 in Proceedings</div>

[17] A Re-Identification Strategy Using Machine Learning that Exploits Better Side Data

<div align="right">Eina Hashimoto, Masatsugu Ichino and Hiroshi Yoshiura</div>

Data on people's daily activities are being collected as big data and then mined for corporate and public purposes. However, concern about privacy is the major obstacle to using such data. Although data anonymisation can mitigate the privacy risk, researchers have shown that people can often be reidentified by linking the anonymised data with other data (i.e. side data). Though re-identification has been improved by the use of machine learning, two problems remain: the unavailability of data and the inappropriateness of the side data. We have developed a re-identification strategy using machine learning in which anonymised data are linked to a different type of side data that are easy to obtain and for which the represented person is easy to identify. We tested our strategy on the re-identification of the owners of 78 anonymous Twitter accounts by using information on résumés as side data. We linked the Twitter posts and résumés by estimating the profiles of the account owners and matching them with those described in the résumés. We were able to link roughly 50% of the accounts to their owners when all tweets were used and roughly 20% of the accounts when only the latest 63 tweets were used. The proposed strategy would help people be better aware of the privacy risks of using personal data and hopefully lead to the implementation of improved protection measures.

<div align="right">Page 221 in Proceedings</div>

[29] Sifting for Deeper Insights from Public Opinion: Towards Crowdsourcing and Big Data for Project Improvement]

<div align="center">32</div>

Jean Marie Tshimula, Mary M. Njuguna, Thierry Roger Bayala, Mbuyi Mukendi Didier, Achraf Essemlali, Hugues Kanda and Numfor Solange Ayuni

Over the years, there seems to be a unidirectional top-down approach to decision-making in providing social services to the masses. This has often led to poor uninformed decisions being made with outcomes which do not necessarily match needs. Similarly from the grassroots level, it has been challenging to give opinions that reach the governing authorities (decisionmaking organs). The government consequently sets targets geared towards addressing societal concerns, but which do not often achieve desired results where such government endeavors are not in harmony with societal needs. With public opinions being heard and given consideration, societal needs can be better known and priorities set to address these concerns. This paper therefore presents a priority-based voting model for governments to collect public opinion data that bring suggestions to boost their endeavors in the right direction using crowdsourcing and big data analytics.

[131] Time Series Electricity Consumption Analysis using Non-negative Matrix Factorization

Akira Kusaba, Tetsuji Kuboyama and Takako Hashimoto

For developing a sustainable society, energy management systems are utilized in many organizations. Chiba University of Commerce (CUC) is one of the organizations that has completely switched to renewable energy-sourced electricity for the first time in Japan. In the campus, energy consumption due to air conditioning, lightning and so on at each room is monitored. These monitoring data are stored on a data server via smart meters. In order to promote awareness to reduce electricity consumption, we need to summarize a vast amount of data so that we can interpret the data easily, and find out where we can afford to save electricity consumption. In this paper, we employ non-negative matrix factorization (NMF) for summarizing time-series electricity consumption patterns to analyze the electricity consumption data over time. Through the data analysis, we show that the visualization of factor matrices by dimensionality reduction enables us easily to interpret the low level electricity consumption data, and it gives us some awareness on energy saving.

[135] Effective feature extraction from driving data for detection of danger awareness

Kotaro Nakano and Basabi Chakraborty

In recent years, the importance of driver's support system is increasing as a solution for dealing with car related accidents. These driving support systems are equipped with functions for avoiding various hazards when the driver drives the vehicle, reducing the risk of causing an accident. In this research, we focus on the time series data of the driving behaviour of the driver, and based on these data, experiments aiming at development of the dangerous driving detection system due to cognitive distraction of the driver have been conducted. The driving behaviour data have been collected from driving simulator which contain driver's actions mainly steering, accelerator and foot brake operations. It has been observed that the driving behaviour of each driver changes while driving in the state of distraction from while driving attentively and by analyzing these changes, the driver's distraction from the normal state can be detected. The objective of this paper is to find the effective features for detection of distracted driving of specific driver in real time (specific short intervals). From the collected data of driving behaviour of multiple subjects, static feature based driving model and dynamic feature based driving model for individual drivers and all drivers for attentive driving and distracted driving have been developed. It can be shown from the results that distracted driving can be identified for individual in real time with stable accuracy using dynamic feature based models.

October 24

Special Session: Security and Privacy in Data-Aware Systems

9:30-10:50 (Room 803)

[33] Second Level Steganalysis - Secret Data Position Prediction Based on Machine Learning

Takumi Saito, Zhao Qiangfu and Hiroshi Naito

In recent years, various cloud-based services have been introduced in our daily lives, and information security is now an important topic for protecting the users. In the literature, many technologies have been proposed and incorporated into different services. Data hiding or steganography is a data protection technology, and images are often used as the cover data. On the other hand, steganalysis is an important tool to test the security strength of a steganography technique. So far, steganalysis has been used mainly for detecting the existence of secret data given an image, i.e., to classify if the given image is a normal or a stego image. In this paper, we investigate the possibility of identifying the locations of the embedded data if the a given image is suspected to be a stego image. The purpose is of two folds. First, we would like to confirm the decision made by the first level steganalysis; and the second is to provide a way to guess the size of the embedded data. Our experimental results show that in most cases the embedding positions can be detected. This result can be useful for developing more secure steganography technologies.

Page 441 in Proceedings

[35] Reversible Data Hiding Scheme based on Difference Expansion using Shiftable Block Strategy for Enhancing Image Fidelity

Chin-Feng Lee, Jau-Ji Shen, Yi-Jhen Wu and Somya Agrawal

The difference expansion (DE) proposed by the Tian is one of the most famous methods of reversible information hiding. This method uses the difference between pixels to embed secret information into the image and can restore the stego-image to the original image, to reach a high embedding capacity and keep low distortion. However, in applications using multi-layer embedding, difference expansion may cause the image quality to deteriorate drastically. In this paper, we proposed a multi-layer shiftable block strategy to modify the block partitioning to hide the secret message. This is done to prevent the data from being hidden in the same block of consecutive layers. Therefore, image distortion is not amplified by the pixel difference of the previous layer, causing a recursive effect by hiding the secret message in the latter layer; thus enhancing image fidelity. The experimental results show an improvement in the image quality of the proposed method.

Page 447 in Proceedings

[39] Effective Dual-images based Reversible Information Hiding Scheme based on Complexity Analysis and Thresholds Controlling

Tzu-Chuen Lu, Jau-Ji Shen and Ting-Chi Chang

Information hiding is a method that can effectively transmit secret messages on the Internet or mobile environment. Among all kinds of information hiding methods, dual-images reversible

information hiding technology has been paid a lot of attention recently because it has better image quality and embedding capacity and realizes the concept of secret sharing. Lu et al. proposed a block folding based reversible dual-images hiding scheme in 2017. They split the secret information into two sections and encode them into smaller digits to improve the quality of the camouflage image. However, this method requires an additional pixel to record section numbers, that will limit the amount of information stored. This study considers the complexity of the block to analysis how many bits can be concealed in the pixel to solve the problem. Two thresholds are used to control the image quality. Experimental results show that the proposed scheme indeed improves the hiding performance.

<p align="right">Page 453 in Proceedings</p>

[41] Hierarchical MQTT with Edge Computation

Hung-Yu Chien, Guo-Hao Qiu, Jian Fu Liao, Ruo-Wei Hung, An-Tong Shih and Chunhua Su

Lightweight Message Queue Telemetry Transport (MQTT) gains its popularity in many Inter of things implementations. However, MQTT is efficient at the cost of weak security support. Moreover, under large connection requests, MQTT brokers would become the bottlenecks and degrade the whole system performance. In this paper, we propose the first Hierarchical MQTT framework with Edge Computation (HMQTTEC). In this framework, brokers are organized in a hierarchical relation, according to their geographical properties or application requirements. The brokers arranged in lower layers handle the data sharing in their domains, perform edge computations (like summation, averaging, etc) on domain data, and report the processed data to their parental brokers. We implement a prototype system for the PM2.5 pollution monitoring application to access the performance of the design. The results and the analysis show the effectiveness and the efficiency of our design.

<p align="right">Page 457 in Proceedings</p>

Special Session: Intuitive Human-System Interaction

9:30-11:10 (Study Room 1)

[12] Equilibrium Predictive Control Based on Mutual Belief Hierarchy for Autonomous Driving

Naoto Iwahashi

Role coordination is crucial in multi-agent collaboration because the collaboration may fail if the roles played by agents are inconsistent. In this paper, we present a role coordination method, Equilibrium Selective Role Coordination (ESRC), for decentralized continuous mutual action control in autonomous driving. In ESRC, the roles of agents are represented by game-theoretic equilibrium points that the agents try to achieve. ESRC comprises three hierarchical functions: (1) action due to given dynamics and constraints, (2) prediction of mutual actions, and (3) selection of roles. Corresponding to this functional hierarchy, three-layered mutual belief hierarchy is adopted. Each agent acts to achieve equilibrium with other agents while selecting an equilibrium point as an appropriate role assignment adaptively and online to reduce risk. The results of simulation experiments conducted demonstrate that our proposed method could produce appropriate actions even in complicated situations where several possible collisions needed to be considered. ESRC can be used to model a wide range of decentralized multi-agent based phenomena, such as human-robot physical interactions, dialogues, economic activities, artificial muscles, and neural information dynamics.

[13] Interactive Evolutionary Computation System Using Multiple Users' Gaze Information Considering User's Partial Evaluation Participation

Hiroshi Takenouchi and Masataka Tokumaru

We investigate an interactive evolutionary computation using multiple users' gaze information when users partially participate in each design evaluation. In the previous study, we confirmed the effectiveness of the proposed system from a viewpoint of real system operation. However, the fluctuation of the users during solution candidate evaluation was not considered. In the actual operation of the proposed system, users may change during the process due to user interchange. Therefore, in this study, we verify the effectiveness of the proposed system when varying the users participating in each evaluation for each generation. In the experiment, we employ two types of situations as assumed real environments. The first situation changes the number of users evaluating the designs at each generation. The second situation employs various users from the predefined population to evaluate the designs at each generation. The experimental results show that, despite the change in the number of users during the solution candidate evaluation, the proposed system can generate coordination to satisfy many users.

[21] Implementation of multi-modal interface for VR application

Yushi Machidori, Ko Takayama and Kaoru Sugita

Recently, some Head Mount Displays (HMD) are released for consumers. A general VR system is provided to a virtual experience with the virtual world according to user's responses organized by three types of components such as an input system, an output system and a simulation system. The input system is used as a controller, a mouse, a keyboard and head tracking device. These devices are used to physical operations on the real world, but these devices are invisible on the virtual world during using the HMD. In this paper, we introduce a multi-modal interface to VR application supporting both voice and gesture interface on a general HMD. We also discuss about a prototype system to use low cost devices such as the HMD, a gesture input device, a general PC and a USB microphone.

[23] Automatic segmentation of left atrial appendage area using heart CT images

Itaru Takayashiki, Akio Doi, Tour Kato, Hiroki Takahashi, Syoto Sekimura, Maiko Hozawa and Yoshihiro Morino

In this study, we propose a method to automatically extract the details of the left atrial appendage region from heart CT images in order to facilitate the preoperative planning of Left Atrial Appendage Occlusion. Generally, it is difficult to automatically classify the left atrial appendage region in a heart CT image because the heart is a very complicated organ. Therefore, in addition to the segmentation method using fully convolutional neural networks, we performed an automatic extraction of only the left atrial appendage region using mini-batch and adversarial training. This method was applied to heart CT images made with a contrast medium. With this method, it becomes possible to automatically obtain information necessary for preoperative planning support of left atrial appendage closure from heart CT images.

[53] Physics Projection

Naoto Iwahashi

This study presents an approach termed physics projection, via which robots can learn about the physical world and predict the effects of their actions online and in an active manner. This approach employs three components: a robot, physical world model, and physics engine. The physics projection process involves a double loop structure comprising a real loop for learning the physical world model and an imaginary loop for a simulation search. Experiments were performed using the TurtleBot3 mobile robot and Unity graphics engine. The results effectively demonstrate that the robot can predict the effects of various actions performed by it under the given physical conditions, successfully execute the tasks of carrying a wine glass and a cup filled with water without dropping them or spilling their contents, and predict a catastrophic effect that could not be predicted by a human operator. The proposed method would contribute to enable robots to predict the effects of their actions and determine appropriate actions to perform in a dynamically changing physical world.

General Session 2

9:30-11:10 (Study Room 2)

[22] Computer-Aided Diagnosis for Lung Lesion in Companion Animals from X-ray Images Using Deep Learning Techniques

Pattaramanee Arsomngern, Nichakorn Numcharoenpinij, Jitpinun Piriyataravet, Wutiwong Teerapan, Woranich Hinthong and Phond Phunchongharn

X-ray radiography in animals has the difficulty of interpretation due to a variety of animals. This leads to image misinterpretation for a non-specialist veterinarian in some clinics that has no radiologist. Based on statistics of veterinary specialists in the US in 2018, the role of radiologist currently faces a shortage problem, especially in the fields of veterinary, which has only 4.2% from all of the other veterinarians. In this paper, we proposed an animal X-ray diagnosis application, namely Pet-X, focusing on the lung lesion problem which has difficulty in interpreting and need to be inspected in many respiratory and cardiovascular related cases. Pet-X automatically learns the sets of dogs and cats thoracic radiograph images, consisting of two positions which are in lateral and ventrodorsal position, pre-processes the images and generates the lung lesion diagnosis model using deep learning techniques (i.e., Convolutional neural networks). The diagnosis model is used to detect the possibility of abnormal lungs, and classify the abnormality in to any three lesion types of abnormal lungs (i.e., Alveolar, Interstitial and Bronchial). The proposed model could achieve a sensitivity 76%, specificity 83.3%, and accuracy 79.6% for lung lesion detection, and a sensitivity 81%, specificity 63.67%, and accuracy 72.3% for abnormal lung classification. Moreover, our application applied the class activation mapping technique to locate the abnormal regions in the images. Finally, Pet-X could assist the veterinarian and radiologist users to diagnose lung lesion in companion animals from X-ray images.

[34] Acoustic-to-Articulatory Inversion of a Three-dimensional Theoretical Vocal Tract Model using Deep Learning-based Model

Thanat Lapthawn and Santitham Prom-On

This paper presents an acoustic-to-articulatory mapping of a three-dimensional theoretical vocal tract model using deep learning methods. Prominent deep learning-based network structures are explored and evaluated for their suitability in capturing the relationship between acoustic and articulatory-oriented vocal tract parameters. The dataset was synthesized from VocalTractLab, a _ three-dimensional theoretical articulatory synthesizer, in forms of the pairs of acoustic, represented by Mel-frequency cepstral coefficients (MFCCs), and articulatory signals, represented by 23 vocal tract parameters. The sentence structure used in the dataset generation were both monosyllabic and disyllabic vowel articulations. Models were evaluated using the root-mean-square error (RMSE) and R-squared (R^2). The deep artificial neural network architecture (DNN), regulating using batch normalization, achieves the best performance for both inversion tasks, RMSE of 0.015 and R^2 of 0.970 for monosyllabic vowels and RMSE of 0.015and R^2 of 0.975 for disyllabic vowels. The comparison, between a formant of a sound from inverted articulatory parameters and the original synthesized sound, demonstrates that there is no statistically different between original and estimated parameters. The results indicate that the deep learning-based model is effectively estimated articulatory parameters in a three-dimensional space of a vocal tract model.

[62] Liver Cancer Prediction using Synthetic Minority based on Probabilistic Distribution (SyMProD) Oversampling Technique

Intouch Kunakorntum, Woranich Hinthong, Sumet Amonyingchareon and Phond Phunchongharn

Liver cancer is challenging to diagnose in general. Moreover, liver cancer prediction can be hindered by skewed data between majority and minority classes, and missing values. Many existing prediction models do not address these two limitations that can make classification results ignore minority instances (i.e., patients with liver cancer are not detected). In this paper, we present a liver cancer prediction model with a new oversampling technique called Synthetic Minority based on Probabilistic Distribution (SyMProD) to handle skewed patients' data from Chulabhorn hospital. SyMProD removes noisy data based on z-score normalization value and adaptively selects referenced data using probability distribution from the ratio of minority and majority closeness factor. The proposed method oversamples minority instances from several minority nearest neighbors to cover the distribution. We employ Random Forest (RF) and Gradient Boosted Tree (GBT) to generate prediction models with stratified five-fold cross-validation. Results demonstrate that GBT with our proposed oversampling technique achieves a better result than other techniques. These results from our technique generate new instances in the minority distribution, avoid the majority region, remove the overgeneralization problem, and reduce possibilities of creating noise and overlapping classes. Our prediction model may help prompt highrisk patients to get a proper diagnosis and treatments in time.

[85] Knowledge Acquisition with Deep Fuzzy Inference Model and Its Application to a Medical Diagnosis

Yuki Mori, Hirosato Seki and Masahiro Inuiguchi

In this paper, we reduce the number of fuzzy rules in the fuzzy inference model and acquire knowledge as fuzzy rules. The number of input items used for the inference model is reduced by randomly selecting the number of input items in each layer. Therefore, it turns out that the number of rules in the whole of this model can be reduced more than that of rules in an inference model that uses all the original input items at one time. However, in the previous model by Zhang, although the consequent part of the fuzzy rule was learned, the antecedent part was not learned. Since we need to deal with the situation where there is no prior knowledge in the problem to apply and it will be necessary to acquire knowledge from data, it is required to learn the antecedent part. In this paper,

we propose a learning method for the antecedent fuzzy sets in fuzzy rules in order to obtain relationship between input and output of the learning data from the actual data. Then, as an example, the proposed method is applied to medical diagnosis of diabetes, the accuracy of the previous method is compared with that of the proposed method.

[91] Ambiguous Utterance Aware: Communication Learning System for Pragmatic Language Disorders Using a Humanoid Robot

Keigo Yabuki and Kaoru Sumi

In this research, we developed a communication learning support system to learn the appropriate dialogue method for communicating with people who have pragmatic language disorders. People with such disorders tend to have problems with interpersonal relationships because they cannot understand the meaning of ambiguous utterances. As a solution to this problem, we developed a communication learning support system that learns whichever dialogue method is easiest to convey to people with pragmatic language disorders, targeting typical development. Our learning support system features a humanoid robot that mimics people with pragmatic language disorders and allows the user to experience the dialogue with such a person, and the user is able to learn how to communicate with such a person while seeking actively transmitted utterances. Experimental results showed that the learning effect was stronger than when using the text-based approach. It was more enjoyable as well. Therefore, this communication learning support system shows excellent potential as a means of learning.

Special Session: Advances on Biomedical Informatics and Engineering for Healthcare (1)

9:30-11:10 (Study Room 4)

[26] Recognition of Nerve and Dura Mater in Spinal Endoscopic Images Using Deep Learning

Peng Cui, Zhe Guo, Jianbo Xu, Tianhui Li and Wenxi Chen

Lumbar intervertebral disc herniation is a common human disease. Nowadays, minimally invasive surgery for the treatment of lumbar disc herniation has been widely carried out. However, endoscopic spine surgery is usually performed by senior and experienced spine surgeons, because serious complications may occur once important tissues damage occurs during surgery. In this research, we developed an algorithm based on YOLOv3 framework to recognize nerve and/or dura mater images under spinal endoscopy. We collected video of surgery from 15 patients with lumbar disc herniation who underwent endoscopic spinal surgery. A total of 4829 images were obtained from these surgery videos, we divided the images into training dataset and test dataset. The training dataset consists of 1385 images of 5 patients, all of which contained images of nerve and/or dura mater. The test dataset consists of 3444 images of 15 patients, 2546 of them contain images of nerve and/or dura mater, and 898 images without nerve and/or dura mater. Three senior endoscopic spine surgeons labeled the nerve and/or dura mater in the training dataset. The results showed that the sensitivity, specificityand accuracy of nerve and dura mater recognition reached 94.27%, 97.55%and 95.12%, respectively. The performance of computeraided diagnosis (CAD) indicates that the system can be effectively identified and recognize nerve and dura mater. The CAD system will be used in endoscopic spinal surgery to assist the endoscopists to identify and recognize nerve and dura mater in the future.

[27] Improvement of ECG based Personal Identification Performance In Different Bathtub Water Temperature By CNN

Jianbo Xu, Tianhui Li, Peng Cui and Wenxi Chen

This paper aims at exploring the variety of Electrocardiogram(ECG) interval and amplitude during different bathtub water temperature and eliminating their influence on personal identification with ECG. There are 10 subjects in the experiment, each subject collects 2 ECG recordings, each recording is at least 220 s. One recording is collected at 38±0.5 ◦ C bathtub water temperature and the other recording is collected at 42±0.5 ◦ C bathtub water temperature. All the raw ECG are removed baseline drift and normalized, then the R peaks are detected and all the R-R interval(RRI) and amplitude are calculated. Through statistical analysis method, we find that the median of RRI in low bathtub water temperature is bigger than in high bathtub water temperature for all subjects, and compared with low bathtub water temperature, the variety of R peaks amplitude has 3 situations in high bathtub water temperature: increase, decrease and unchanged. Then all the QRS complex are segmented and are taken as training data and test data. During the training stage, there are 3340 training datasets, 1670 training datasets are from low bathing water temperature and the other 1670 training datasets are from high bathing water temperature. In the testing stage, first we use 410 testing data which are from low bathtub water temperature to test the trained model, the best and robust identification rate is 87.07%, when we use the other 410 testing data which are from high bathtub water temperature to test the trained model, the best and robust identification rate is 87.32%. To the best of our knowledge, this is the first time to explore the variety of ECG interval and amplitude during different bathing water temperature. However, further improvements are still needed during different bathing environment.

[61] Utilizing Subject-Specific Discriminative EEG Features for Classification of Motor Imagery Directions

Kavitha Thomas, Neethu Robinson and Vinod A P

Electroencephalogram (EEG)-based BrainComputer Interface (BCI) technology needs efficient algorithms to find distinct EEG patterns/features to realize applications with distinct high-dimensional control signals. This paper proposes a novel feature extraction methodology for separating EEG patterns associated right hand motor imagery performed towards left and right directions. The most discriminative subject-specific feature set is chosen based on Fisher's ratio of absolute phase values of EEG in 6 low frequency sub bands. Using this, the proposed BCI system is capable of providing better classification results than state-ofthe-art methodology with fixed channels, fusing absolute phase and spatial features from selected subject-specific discriminative channels. Experimental analysis shows that though parietal lobe is vital in providing distinguishable features, the channel set that provide maximum accuracy, is highly subject-specific. Hence, subject-specific BCI that can decode finer parameters of imagined movement are feasible and further research to understand the activations elicited in parietal lobe can contribute towards robust BCI systems.

[73] Continuous Cuffless Blood Pressure Estimation Based on Pulse Transit Time: A New Evaluation with Invasive BP Reference

Zunyi Tang, Ying Chen, Shing-Hong Liu, Toshio Kobayashi and Wenxi Chen

One of the indirect approaches to obtain blood pressure (BP) values is through the so-called pulse transit time (PTT) that is the time for the cardiac wave to propagate through a length of the arterial tree or between the heart and a peripheral arterial site. In this work, we investigated the performance of four latest cuffless BP estimation methods including the method proposed in our previous work by using the invasive BP as reference. The invasive BP data was collected from 10 patients during surgery. Experimental results showed that the estimation errors from the compared methods are much larger than the 5 ± 8 mmHg limits that is required for any BP measurement method or instrument to be satisfied the requirements of the AAMI Standard. Therefore, the PTT-based BP estimation methods need to be further improved and enhanced for obtaining acceptable performance.

[74] Sleep Stage Classification Based on EEG, EOG, and 4-stage Deep Learning Model

S.M. Isuru Niroshana, Xin Zhu, Ying Chen and Wenxi Chen

This paper presents a CNN-GRU deep learning model for classifying sleep stages. The Conventional sleep stage scoring method is a visual classification process, based on a set of biomedical signals such as Electroencephalogram (EEG) and Electrooculogram (EOG), where high human intervention is required. In this study, we proposed a deep neural network involving convolutional neural networks and gated recurrent units, to automatically extract the most appropriate features and sequence trends of PSG signals, without utilizing hand crafted features for scoring sleep stages. The proposed model, which uses multiple PSG channels, was evaluated using two data sets collected from 184 patients and 70 healthy subjects. The proposed multi-channel model showed 91.9 % of overall accuracy, while recall, precision, and f1 measures were approximately 92 % for patients. For healthy subjects, the multi-channel model showed 89.3 % overall classification accuracy. Recall, precision, and f1 measures showed approximately 89 %. The main model was adapted to utilize with a single EEG channel configuration, which yields 4 single-channel models for each data set. Therefore, the proposed model is capable of performing sleep stage classification using a single EEG channel without altering the model architecture.

Special Session: The Data Analysis and Intelligent Computing for Awareness Applications (1)

11:30-12:10 (Study Room 1)

[5] Finding Longest (s, t)-paths of O-shaped Supergrid Graphs in Linear Time

Ruo-Wei Hung

The longest path and Hamiltonian problems were known to be NP-complete. In spite of many applications of these problems, their complexities are still unknown for many classes of graphs, including supergrid graphs with holes and solid supergrid graphs. In this paper, we will study the complexity of the longest (s, t)-path problem on O-shaped supergrid graphs. The longest (s, t)-path is a simple path from s to t with the largest number of visited vertices. An O-shaped supergrid graph is a rectangular supergrid graph with one rectangular hollow. We will propose a linear-time algorithm to find the longest (s, t)-path of O-shaped supergrid graphs. The longest (s, t)-paths of O-shaped supergrid graphs can be used to compute the smallest stitching path of computerized embroidery machine and 3D printer when a hollow object is printed.

Page 252 in Proceedings

[9] Quality Enhancement of P2P using Interested Clusters in the P4P Architecture

Shu-Ching Wang, Yu-Ling Lin and Hung-Hsuan Wang

As Peer-to-Peer (P2P) emerges as a major paradigm for scalable network application design, so the application of P2P services is one of the interested topics in web services. However, too many P2P applications may lead to low utilization of network resources or low performance of application services. P4P (Proactive Network Provider Participation for P2P) is a kind of P2P network optimization techniques. In order to reduce the traffic and operating costs of Internet Service Provider (ISP) and P2P service providers, P4P provides the communication between ISP and P2P service providers by cooperation. Therefore, an Interested Clusters based P4P (ICP4P) is presented in the study that ICP4P can reduce the network traffic and increase network robustness. Then, the quality of service and the stability of P2P can be reached.

Page 260 in Proceedings

General Session 4

11:30-12:10 (Study Room 2)

[8] A Study on Multi-objective Chaotic Evolution Algorithms Using Multiple Chaotic Systems

Zitong Wang and Yan Pei

We investigate the optimization performance of multi-objective chaotic evolution (MOCE) algorithm with implementations using different chaotic systems. A comparison experiment of MOCE algorithms with four chaotic systems are employed in MOCE to analyse whether chaotic systems will affect the optimization performance of the MOCE algorithms. We analyze and discuss the performance of the MOCE algorithms implemented using different chaotic systems. Four chaotic systems are introduced in this work, i.e., the logistic map, the Hénon map, the tent map, and the Gauss map, respectively. The number of Pareto solution and the diversity of Pareto solution are two

evaluation metrics to evaluate the performance of the multi-objective optimization algorithm. We apply the statistical tests to analyse and investigate the number of Pareto solution and their diversity. The evaluation results indicate that the MOCE with the logistic map has the best optimization performance in both the number of Pareto solution and their diversity. The statistical significance demonstrates that chaotic systems have a great influence on the optimization performance of MOCE algorithms.

[20] Parallel Implementation of Chaos Neural Networks for an Embedded GPU

Zhongda Liu, Takeshi Murakami, Satoshi Kawamura and Hitoaki Yoshida

The Internet of Things (IoT) has become ubiquitous, and the need for higher information security is increasing. The CPU usage cost of IoT devices to process information security tasks is large. In the present paper, we study a parallel implementation of chaos neural networks for an embedded GPU using the Open Computing Language (OpenCL). We evaluate this parallel implementation, and the results indicate that it can extract a pseudo-random number series at high speed and with low CPU usage. This implementation is remarkably faster than the implementation in the CPU and is approximately 49% faster than AES in counter mode. The rate of pseudo-random number generation is higher than 2.1 Gbps when using 100 compute units of a GPU. Applying a stream cipher is sufficient even for Internet communication. Extracted pseudo-random number series are independent, have fine randomness properties, and can merge into one series applied to a stream cipher.

Special Session: Advances on Biomedical Informatics and Engineering for Healthcare (2)

11:30-12:10 (Study Room 4)

[77] A New Approach to Classify Knee Osteoarthritis Severity from Radiographic Images based on CNN-LSTM Method

Rima Tri Wahyuningrum, Lilik Anifah, I Ketut Eddy Purnama and Mauridhi Hery Purnomo

This paper introduces a new approach to quantify knee osteoarthritis (OA) severity using radiographic (X-ray) images. Our new approach combines preprocessing, Convolutional Neural Network (CNN) as a feature extraction method, followed by Long Short-Term Memory (LSTM) as a classification method. Preprocessing is conducted by manually cropping on the knee joint with dimensions of 400 x 100 pixels. The public dataset used to evaluate our approach is the Osteoarthritis Initiative (OAI) with very promising results from the existing approach where this dataset has information about the KL grade assessment for both knees (right and left). OAI is a multicenter and prospective observational study of knee OA. The purpose of this dataset is to develop public domain research resources to facilitate scientific evaluation of biomarkers for OA as a potential replacement endpoint for disease development. We have experimented by using three-fold cross-validation, where the first 2/3 data becomes the training data, while the last 1/3 data work as the testing data. Those groups data are being rotated with no overlap. Obtained results demonstrate that the mean accuracy is 75.28 %, and the mean loss function using cross-entropy is 0.09. These results outperform the deep learning methods that have been implemented before.

[105] The Effect of Stress on Optimal Bathing Time

Tianhui Li, Jianbo Xu, Peng Cui and Wenxi Chen

Along with advances in medical technology and improvement in living standards, personal daily health management has got more and more attention. Bathtub electrocardiogram (ECG) has become an important index of personal daily health management. A study is conducted with one participant on a daily basis over one year. Bathtub ECG is measured during his daily bathing and used for heart rate variability (HRV) analysis. HRV stress index (SI) and optimal bathing time are calculated. The data of low SI and high SI are selected to analyze the effect of stress on the optimal bathing time. The results show that the optimal bathing time is delayed and it takes longer to achieve the comfort of bathing in the case of high SI.

Special Session: The Data Analysis and Intelligent Computing for Awareness Applications (2)

13:30-14:50 (Study Room 1)

[10] Use Product Segmentation to Enhance the Competitiveness of Enterprises in the IoT

Shu-Ching Wang, Yu-Ling Lin and Chan-Grong Dai

With the development of technology, the world of Internet of Things (IoT) is more and more developed, resulting in the rapid growth of diversified data and the formation of Big Data. Extract suitable data from a pile of seemingly useless materials, and apply different analysis and processing methods to form new and valuable data for the enterprise to enhance the competitiveness of the enterprise. Therefore, in this paper, the SOM (Self-Organization Map) will be used to aggregate the samples with similar characteristics from the product. In addition, RFM data analysis technology is used, we find out the more valuable customers in each cluster to solve the problem that the RFM total score has a large difference in different product attributes. After identifying the customers who are more valuable to the company, they then observe the products they purchased based on their past transaction data, perform the FPGrowth algorithm and construct the FP-tree. Finally, find out the frequent itemsets of the products through FP-tree and observe their relevance to provide companies with more accurate marketing strategies.

[11] The Data Analysis for the Influence of Cross-cultural Training on the Adaptability of Foreign Workers

Shu-Ching Wang, Wei-Shu Hsiung and Yi-Syuan Lin

Industrialization has brought many foreign workers into a country, and this situation is an inevitable event. The inflow of foreign workers may help to resolve unnecessary vacancies rejected by local workers. However, the influx of foreign workers has actually brought many effects that affect the country's economic growth. With the booming economy in Taiwan, the industrial structure is undergoing more and more changes. Because foreign workers are different from our culture, education and training programs should be fully prepared. Therefore, while training foreign workers, there should be a concept of "intercultural training." Because data analysis is the process of systematically applying statistical and/or logical techniques to describe and illustrate, condense and recap, and evaluate data. Therefore, this study will focus on "intercultural training" for foreign

workers. This study used relationship analysis, factor analysis and regression analysis as statistical tools. The study found that ethnic cultural differences and crosscultural training have had a positive impact on overseas adoption of foreign workers. This research hopes that this research can provide better education, training, acceptance, and more reference for government, enterprises, human resources agents and other related units to find comparable work talents.

[15] Alterations in brainwaves caused by different Music Genres

Shao Kuo Tai and Yujen Kuo

In recent years, many studies have shown that music affects brainwaves. However, music also has the power to stimulate strong emotions. If music is classified by emotion, will the music of different emotions have different effects on brain waves? The focus of this study was to observe brainwaves as subjects listen to different emotional types of music to verify whether the music of different emotional categories has different effects on brain waves. We classify music by the circumplex model of emotion and select four pieces of music from the different subdivision in that model as our experimental music. Study adopt MindWave Mobile as the primary sensing component, which is a sensor for detecting brainwave and output the electroencephalogram (EEG). The collected brainwave data was tested and processed by the experimental module of this study and use T-Test to evaluate the effects of music on brainwaves. In the experimental results, we found that the arousal score of music in the circumplex model of emotion does have the positive relationship with the alpha wave, and for other brainwaves do not have adequate evidence to prove their connection.

[18] Similar Music Instrument Detection via Deep Convolution YOLO-Generative Adversarial Network

Christine Dewi, Rung-Ching Chen, Hendry Hong and Yan-Ting Liu

Object detection and image recognition are important research topics in machine learning and artificial intelligence. The major challenge of the computer vision image recognition is to detect and recognize a similar object. Generative Adversarial Network (GAN) based on Convolution Neural Network (CNN) is proposed to faces this challenge. The advantage of the GAN is represented by its architecture which consists of a generator and discriminator to detect real or fake image generated by the machine. In this paper, we adopt the advantage of GAN and combine with YOLO algorithm to identify similar music instruments. YOLO is fast Region based CNN with powerful computation. Using Deep Convolution YOLO-GAN will enhance the capability of YOLO detection process and outperform the original YOLO capability.

General Session 5

13:30-14:50 (Study Room 2)

[37] Bridge Sub Structure Defect Inspection Assistance by using Deep Learning

Pravee Kruachottikul, Nagul Cooharojananone, Gridsada Phanomchoeng, Thira Chavarnakul, Kittikul Kovitanggoon, Donnaphat Trakulwaranont and Kanokwan Atchariyachanvanich

Road transportation is the most popular transportation in Thailand, which the top two highest traffic are the region-to-region highways; and then inter-city highways. Therefore, the regular maintenance is required to maintain the good condition due to road safety. The most significant process of bridge inspection procedures is sub structure inspection, which requires visual inspection as an initial step. This process is used to quick determine the damage severity i.e. appearance and crack that may cause damage to the structure strength. The current process requires that the experienced maintenance engineer to be on the field in order to visual inspect and estimate whether the maintenance is required. Yet, due to the limitation of number of expert engineers to be on the field, the photo verification is introduced to assist them so that they are no need on every inspection site. However, using human to verify has no standard and uncontrollable. They need to have experience and good knowledge. As well as it is highly depended on individual decisionmaking skill. Thus, in this paper, the deep learning technique will be presented to assist the expert for quality inspection process of bridge sub structure images. That is using image enhancement and then image splitting and overlapping for image pre-processing. After that applying CNNs for object classification. As a result, the total accuracy is 89% based on 3926 dataset.

Page 57 in Proceedings

[94] Non-reference Quality Assessment Model using Deep learning for Omnidirectional Images

Truong Quang Tung, Huyen Thi Thanh Tran and Truong Cong Thang

Image quality assessment (IQA) has been a popular research topic in image processing. However, most studies until now have been focusing on traditional images and only a few focused on omnidirectional images. Unlike in the case of traditional images, the users can only view a part of 360degree images at a time, and thus tend to focus more on specific regions of the image. This makes predicting quality scores for omnidirectional images a challenging task since most existing models for traditional images usually treat all regions of the image equally. In this paper, we propose an omnidirectional image quality assessment model based on deep learning. This model focuses on learning the features of the middle region of input images. The model first automatically predicts the quality scores for patches sampled from the input image. The quality score of the image will then be calculated by weighted averaging of the patch quality scores based on their positions. Experimental results show that the proposed model provides very promising accuracy for predicting quality scores of omnidirectional images.

Page 140 in Proceedings

[120] Dehazed Image Enhancement by a Gamma Correction with Global Limits

Cheng-Hsiung Hsieh

Single image haze removal has been an active research topic in the image enhancement or image restoration community. Most of researchers have put their effort to improve the dehazing performance through modifying algorithm itself. In this paper, we propose a post-processing scheme, which is a gamma correction, to enhance the visual quality of a dehazed image after some dehazing algorithm. It is well-known that the conventional gamma correction (CGC) severely suffers from the due distortion in many cases. Thus, it hinders the application of the CGC to dehazed image enhancement. By our observations, the problem is caused by the local limits, which are found in the RGB components separately. To relieve the problem, a gamma correction with global limits (GCGL) is introduced, where the global limits are obtained by the minimum and maximum in the RGB components. The proposed GCGL is justified and applied to dehazed image enhancement. The simulation results indicate that the visual quality of dehazed images have been generally improved in the given examples.

Page 182 in Proceedings

[126] Object Dynamics from Video Clips using YOLO Framework

Wei-Hsiang Chung, Goutam Chakraborty, Rung-Ching Chen and Cédric Bornand

In this paper we present a real-time object detection in the warehouse, to predict collision arising from moving forklifts andraising alarm when necessary. There are many research using YOLO for real-time object detection like detecting person or cars for Advanced Driver Assistance System(ADAS). There are many cargoes in the warehouse. Employees need to collect them and deliver to other place. When the employees are driving the forklift with many cargoes or big shipments that may block there vision to see objects in front of them. The employee driving the forklift might not see cargoes stored at the corner while turning, causing accident. The system will identify objects in real-time, received through surveillance camera set at a height from where it can clearly capture required frames to predict collision. If the camera predict that there will be an imminent collision, it will sound the alarm.

Special Session: Disaster Awareness Communication Networks, Systems, and Applications

13:30-14:30 (Study Room 4)

[79] Implementation of a Quality Measurement Software for Virtual Reality Content on a head mount display

Ko Takayama, Yushi Machidori and Kaoru Sugita

In a VR streaming content, an application software is necessary to control both a content quality on a streaming service and a display quality on a head mount display (HMD) according to loads for head mount display, computer facilities and network considering a user's requests. In this paper, we focus about a quality measurement software for Virtual Reality (VR) content to control display quality on a HMD and discussabout its implementation.

[115] Proposal on the Disaster Information System based on QoS Controls of Heterogenious Radio Networks and Radio Atomosphere

Noriki Uchida, Kanji Nakano, Chiho Takegawa, Tomoyuki Ishida and Yoshitaka Shibata

Although there recently have been great developments of the DIS (Disaster Information System) such as the new kinds of mobile applications or resilient networks, it is considered that there are still some significant problems. Therefore, this paper proposed the QoS controls of the heterogeneous radio networks including IoT networks and the autonomous disaster information sharing methods for the nextgeneration DIS. In details, the classifications of the proposed QCI is used for the SDN controls of the proposed routing and switching method in the core network. Also, the Radio Atmosphere is proposed for the awareness of the damaged areas by the changes of the RSSI levels from IoT/WiFi/LTE/5G radio networks. Then, the implementations of the prototype system are reported, and the evaluations indicate the system works properly in this paper.

[117] Evaluation of Performance on LPWA Network Realizes for Multi-wavelength Cognitive V2X Wireless System

Akira Sakuraba, Yoshitaka Shibata and Toshihiro Tamura

Vehicle-to-everything (V2X) communication is a base technology for realizing future mobility. Vehicle onboard sensors and their output data analysis, dangerous road areas can be identified such as icy road. V2X communication allows exchange them among vehicles instantly. This paper introduces a cognitive V2X wireless system which exchanges road surface state information among running vehicles and roadside communication units (RSUs). This approach is based on combination of multiple standard wireless links which have different characteristics. Our system has two different standard of wireless LAN links to deliver road state information by bulk messaging, and one long-range LPWA link in order to exchange network information and node location before vehicle moves into wireless LAN range. We designed the V2X communication which is independent from public packet wireless network in order to provide highly availability in case of disaster, not only road surface information providing in normal time. We have measured network performance on LPWA link in field experiment, our proposed method and setup can deliver message for other node which is located at about 1,000 m distance.

<div align="right">Page 434 in Proceedings</div>

Special Session: Security and Privacy in Data-Aware Systems (2)

13:30-14:50 (Room 501)

[43] Image Steganographic Scheme Based on Double-layer Magic Matrix

Jau-Ji Shen, Chin-Feng Lee, Yen-Hsi Li and Somya Agrawal

Data hiding is a technique used for embedding secret messages in a carrier medium which cannot be perceived by human eye. In the data hiding scheme based on the magic matrix, previous methods exploited a magic matrix with various shapes to carry secret messages, but the embedding capacity was often limited. Inspired by the magic matrix scheme using magic signet proposed by Lee et al., the proposed method develops a doublelayer magic matrix scheme to enhance the embedding capacity. Under the framework of a double-layer matrix, we tested many combinations of different signet sizes which can carry secret data in various notational number systems. The experimental results show that the proposed scheme had a higher embedding capacity and good image quality compared to the previous methods.

<div align="right">Page 462 in Proceedings</div>

[44] Exploration of Fast Edible Oil Classification Using Infrared Spectrum, Machine Learning, and Chemometrics

Hung-Yu Chien, An-Tong Shih and Y. M. Tseng

Your food is your medicine. Edible oils take important parts in people's daily food, and taking good-quality oils plays an important role to the health. However, as the supply cannot satisfy the market demand and some good-quality edible oils are expensive, many incidents of adulterated and fraudulent edible oils have been reported. In Taiwan, some common adulterated edible oils and fraudulent edible oils incidents include (1) mixing good-quality oils with low-quality oils, but labeling the products as high-quality products; (2) importing cheap and low-quality oils abroad, but labeling them as good-quality ones; and (3) fraudulent labeling with wrong ingredients. Even though

<div align="center">48</div>

high-tech laboratories can differentiate the products and identify ingredients, the popular technologies demand high costs in terms of money, time, and man power. The general cannot easily access these technologies and should only depend on occasional reports from the governments or from some trusted institutions. Furthermore, the jurisdiction process takes a long time, and the punishment is relatively light, compared to the illegal interests. It is, therefore, crucial to develop new technologies that can effectively and efficiently differentiate different edible oils or even identifying concerned ingredients in edible oils. Due to dropping prices of infrared spectroradiometers and advances in machine technologies and chemometrics, we would like to integrate these technologies to develop a process that can fast and effectively differentiate different edible oils and even identify suspicious ones. The preliminary experiments show some promising results and potential. We also point out some challenges for future work.

[65] Fault-Tolerant Visual Secret Sharing Scheme Using Meaningful Shares

Yu-Chun Chung, Jia-Hao Ou and Justie Su-Tzu Juan

Security problem is becoming increasingly crucial in many fields. In order to ensure that secret images are not being stolen during information transmission, a preferred way is to encrypt them before transmission. Visual secret sharing scheme Ŕ) is a scheme of secure communication technology in which (VSSŔ a secret image is encrypted into some shares and then restored through human vision by stacking shares directly. A fault-tolerant VSSS is a VSSS which is not necessary to align the shares precisely when recovering the secret image. In the other side, encrypting a secret image into two meaningless shares might invite the attacker's attention. Therefore, this paper proposed two faulttolerant VSSS which encrypt one secret image into two meaningful shares, and with the fault-tolerant mechanism.

[84] A Study on Security Trend based on News Analysis

Chia-Mei Chen, Dan-Wei Marian Wen, Jun-Jie Fang, Gu-Hsin Lai and Yi-Hung Liu

Workload of cybersecurity administrators has significantly increased with the proliferation of the internet and the accompanied cyberattacks. In order to help firms to identify most recent and emerging cyberattacks in a timely manner, this research applies machine learning methods to detect cybersecurity trends. As the rich, multifaceted, and updated online cybersecurity news serve as key information sources for cybersecurity administrators, this research utilizes the wealth of online cybersecurity news as the data source and develops a system to automatically collect multiple online cybersecurity news outlets, analyze collected news to detect emergence of cybersecurity events and present trend of cybersecurity news. This research can facilitate cybersecurity administrators in saving their time to read through multiple cybersecurity news websites and organize events from their memories or other records, thus enhance firms' capacity to actively protect against potential cyberattacks.

Special Session: The Data Analysis and Intelligent Computing for Awareness Applications (3)

15:20-17:20 (Study Room 1)

[30] Estimation of the Kansei Information obtained from Musical Scores via Machine Learning Algorithms

Satoshi Kawamura, Zhongda Liu and Hitoaki Yoshida

This study investigates whether machine learning algorithms can be used to accurately classify tempo into two classes based only on the musical note sequence written on musical scores. Herein, the tempo that is manually estimated by looking at the score is simulated via Kansei (emotional) information processing. The tempo threshold was set at ♩ = 120. Results showed that even after successful learning, the algorithms showed low recognition rates while classifying slow tempo class from the evaluation data and some data were erroneously recognized. In contrast, the algorithms showed high recognition rates when classifying fast tempo class from the evaluation data. The algorithms did not show any recognition error in the data.

[42] A Study of Social Media Reviews Effects on the Success of Crowdfunding Projects

Long-Sheng Chen and Ying-Jung Chuan

Crowdfunding has become one of the important channels of getting fund for many start-ups. But, the low success rate has been a critical issue. Therefore, how to increase the success rate of fundraising projects is one of the main concerns of all fundraising activities. This work aims to study the effect of sentiment of reviews for the success of crowdfunding projects. We will use data mining and text mining to analyze the collected data. Least absolute shrinkage and selection operator (LASSO) and back-propagation networks (BPN) based feature selection will be employed to find the important factors for the success of crowdfunding projects. Next, support vector machines (SVM) will be employed to evaluate the performance of selected factors set. Experiment results can help fundraisers to increase the success rate of crowdfunding projects.

[46] A Study of Influences of Social Network Awareness on MOOC Learner Behaviors: Case of Chulalongkorn University Free MOOC

Nagul Cooharojananone, Orawun Moolpun, Pitchapa Pawong, Jidapa Dilokpabhapbhat, Thanaporn Rimnong-Ang, Manutsaya Choosuwan, Pattamon Bunram and Suporn Pongnumbkul

In 2017, Chulalongkorn University has started an online learning platform providing many interesting courses by Chulalongkorn University lecturers that allows anyone to learn for free (Chula MOOC). However, each course is opened for certain period of time. If any courses are popular, they will be re-opened for the next batch. For each batch, a Facebook group is created to connect between learners and the instructor. However, we noticed that even in some popular courses, there are some learners who completed the course and some who did not complete the course. From this problem, we think that the data from each course Facebook group might give us some useful information related to the motivation behavior to finish the course. Therefore, in this work, we analyzed data from Facebook graph API from a popular course in three batches using statistics. Data consists of the amount of activities, instructor activities, learners' activities and instructor and learners' interaction activities. We also used some information from Chula MOOC platform. The result shows that the Facebook group is an area where students participate in the interaction, which has helped to motivate other learners in the group or who may not be interested to continue their learning or complete their learning. We also introduce that the chatbot could help to motivate the students to complete their course. For example, sending the messages to encourage others or asking students in the time that seem to be more dropout. Currently, we are developing the chatbot for checking the hypothesis further.

[59] Productivity-based Features from Article Metadata for Fuzzy Rules to Classify Academic Expert

Diana Purwitasari, Chastine Fatichah, Adri Gabriel Sooai, Surya Sumpeno and Mauridhi Hery Purnomo

Since modeling expertise is necessary in an expert recommendation system, this paper addressed the issue to obtain researcher expertise in the academic field on certain topic interest. The profile considers productivity and dynamicity of an expert. The productivity of research activities through published articles as research output determine expertise that changes over time to indicate the dynamicity aspect. Here, the resulted expertise status on certain topic interest augments the expert profile. However, the expertise status is unavailable in the expert finder dataset. This paper discussed on approaches to classify the status from features of productivity and dynamicity in the form of fuzzy rules, which can be applied later in the expert recommendation system. Then, the approaches include of determining topics, mapping expertise candidates, extracting features, and labeling expertise status for training to generate fuzzy rules. Because of unavailable expertise status, to get better labels, the results of linear model and clustering were compared. Based on the empirical experiments, rules trained from scaled data with expertise labels from fuzzy clustering gave better results. After simplifying the rules, if-then forms with two features were representable enough for identifying the status of specialist or thriving experts on a topic interest.

[101] A Short Answer Grading System in Chinese by CNN

Shih-Hung Wu and Chun-Yu Yeh

Short answer question is a common type of test in various level of learning. However, it is not common to test students with the short answer questions online, since automatic short answer grading is not easy. In this paper, we report a short answer grading system based on deep learning model CNN. We test the system on two corpus in Chinese. The first one is translated from a public available corpus in English. We also curate a corpus by ourselves. We get promising result on both data set.

[132] Detection of suspicious route by classification of ships based on machine learning

Shoichi Ichimura and Qiangfu Zhao

In recent years, the traffic volume on the sea has increased significantly. Compared with road traffic management, sea traffic management is very difficult due to many reasons. For safety sailing, automatic identification system (AIS) has been introduced. Using AIS signals, it is possible to understand the position, velocity, and other information of each sea-going ship, and thus can detect possible dangers and provide necessary rescue promptly. However, some ship owners may not set their AIS correctly, and thus the AIS signals may not be trustable. The purpose of this study is to propose a method to classify the true ship type using the AIS signal and provide a way to support traffic management. Specifically, we extract the "signature characteristics" of the ship from its AIS signal, and then classify the ship type using a machine learning model. Primary experimental results show that the average accuracy is about 87.3% if we use a multilayer perceptron. Better results are expected if we use more data.

General Session 7

15:20-17:20 (Study Room 2)

[49] Misinformation Containment in OSNs leveraging Community Structure

Arnab Kumar Ghoshal, Nabanita Das and Soham Das

With the emergence of Online Social Networks (OSNs) as a major platform of communication, its abuse to spread misinformation has become a major threat to our society. In this paper, we study the misinformation containment problem in OSN. Given a snapshot of the OSN with a set of misinformed nodes, and a budget in terms of maximum number of seed nodes, the problem is to select the seed nodes, referred here as the beacon nodes, to plant the correct information, to minimize and eventually eradicate the misinformation at the earliest. We leverage the community structure of the OSN to select the beacon nodes, prioritizing the Community Boundary Nodes. To the best of our knowledge, this is the first work to exploit the topology of the OSN to combat misinformation spread. A modified form of Independent Cascade Model is followed to study the adversarial propagation of both misinformation and the correct information. Simulation on real data set shows that the proposed algorithm outperforms earlier algorithm [1] significantly in terms of maximum (average) infected time and the point of decline.

Page 75 in Proceedings

[64] Detecting Anomalous Events on Distributed Systems Using Convolutional Neural Networks

Purimpat Cheansunan and Phond Phunchongharn

Detection of anomalous events is very crucial for the maintenance and performance tuning in long-running distributed systems. System logs contain the complete information of system operation that can be used for describing the situations of the computing nodes. However, log messages are unstructured and difficult to utilize. In this work, we propose a novel anomaly detection framework in a Hadoop Distributed File System (HDFS) that transforms the log messages to structured data and automatically monitors the system operation logs using Convolutional Neural Networks (CNN). We evaluate the performance of anomaly detection in terms of precision, recall, and f-measure. The proposed framework can provide with precision = $94.76 \pm 0.81\%$, recall = $99.53 \pm 0.23\%$, and f-measure = $97.09 \pm 0.49\%$. To apply the proposed framework in the practical application, we also concern about the training time and prediction productivity. From our experimental results, our proposed framework outperforms the existing models (i.e., LSTM and Bi-LSTM) with higher recall, lower training time, and higher prediction productivity.

Page 105 in Proceedings

[76] Static Analysis Method on Portable Executable Files for REMNUX based Malware Identification

Muhammad Salman, Nindya Viani and Diyanatul Husna

Malware is one of the most dangerous threats in the digital world today and in the future. Today, technological developments do not only give benefits but also reap serious challenges. One of the threats is the breach of computer network security system. Malware can be inserted anywhere, especially on various types of files that can be downloaded from the internet. It is important to analyze malware for of its complex development. This research projects our work on testing and

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analyzing executable files by utilizing various tools on REMnux operating system. It is aimed to recognize whether a file is safe or contains malware. The results of this study indicated that REMnux can be an appropriate tool to check a file's characteristics in the form of malware or not based on anomalous data check, metadata of file integrity, section entropy, and function that will be executed by that executable file. In addition, the results can also estimate the impact of malware performance if the file execution is not intentionally done by reverse engineering.

[103] A Framework for Usability Design to Promote Awareness of Information Disseminated via Mobile Government Applications

Pinnaree Kureerung and Lachana Ramingwong

Mobile application have become the first choice for disseminating information in several situations. Many government agencies developed m-government applications, mainly for information dissemination and electronic services delivery. Information has great effects to citizen's life in several ways. Warning messages are an obvious example. They are usually provided to people in affected or risk areas. Effective information dissemination of such information requires more than assembling them on the user interface. It requires a careful design. Designing how they are presented is not an easy task. Moreover, effective and efficient presentation can be difficult. Appropriate presentation aids in understanding of information and gives the correct clue on what to do next. This paper presents the analysis of usability factors to support design and development of m-government applications which main task is information dissemination. Existing usability models were analyzed. Hundreds of publications in related areas were reviewed. Then, usability factors to m-government applications were collected and clustered. The usability design framework is proposed to promote effective use of the usability factors in the development process. The framework is designed to support incorporation of usability factors that lead to usable interface. The factors included in the framework are Learnability Satisfaction, Memorability, Simplicity, Privacy, and Security.

[133] Definition and Goal of Graph Clustering - Motivation to Explore a New Algorithm

Yuching Lu and Goutam Chakraborty

In recent years, one of the popular method for mining evolving data, is to convert it to a network, in fact an adjacency matrix, where data units are nodes and their relations/similarity are the link weights. The network is then partitioned into communities to explore information hidden in the data. For last 50 years, various graph partitioning algorithms are proposed. Depending on the application, the optimization objective of the partitioning and the resulting clusters are different. Different algorithms, based on Linear Algebra, heuristics with different greedy optimization criterion, agglomerative algorithms, are proposed to meet different optimization criterion suitable for target network and application. In this work we proposed a genetic algorithm (GA) based dynamic clustering algorithm. Genetic algorithm (GA) for graph clustering, with fitness function as the modularity index, is already proposed, in our previous works. In this work, we propose a multimodal GA. The algorithm starts with modularity index (Q) as the optimization criterion. Once converged, we add another term in the fitness function which will balance the cardinalities of the partitions. The parameters are computed based on the partitions after the first stage of convergence. We continue to run the Genetic search with modified fitness function until a second convergence is achieved. In all our experiments, not only could we achieve better balance of the size of different clusters, in many experiments it actually improved the modularity index. For a highly modular graph, with $Q \geq 0.7$, most of the algorithms produce the same result. When the optimum modularity index of the graph is low, GA with only modularity index as optimization criterion usually converges in local minimum. With the proposed modification, we could always find clustering with an improved Q value. We run

popular partitioning algorithms on known realworld networks and found that the proposed algorithm could find better partitioning, closest to reality.

[134] Selection of Effective Features for BGP Anomaly Detection

Tastuya Arai and Basabi Chakraborty

Border Gateway Protocol (BGP) is the internet's default protocol for managing connectivity between Autonomous Systems (AS). Anomalies happen to occur time to time and it is a threat to cyber security. There are various types of BGP anomalies and over the years researches have been done for their detection. Here machine learning techniques are used for detection of BGP anomaly from BGP update messages by considering the problem as a two class classification problem. A set of 35 features are extracted from BGP update messages for Slammer, Nimda and Code Red I attacks. The main objective of this study is to find out important features for detection of BGP anomaly. Popular feature selection algorithms, wrapper as well as several filter based algorithms are used for feature ranking. It is found that at most top 10 features are sufficient for the best classification accuracy which is verified by several classifiers.

Special Session: Medical Data Analytics

15:20-17:00 (Study Room 4)

[57] Deep Learning for Automatic Identification of Nodule Morphology Features and Prediction of Lung Cancer

Weilun Wang and Goutam Chakraborty

Lung Cancer is the most common and deadly cancer in the world. Correct prognosis affects the survival rate of patient. The most important symptom for early diagnosis is nodules images in CT scan. Diagnosis performed in hospital is divided into 2 steps : (1) Firstly, detect nodules from CT scan. (2) Secondly, evaluate the morphological features of nodules and give the diagnostic results. In this work, we proposed an automatic lung cancer prognosis system. The system has 3 steps : (1) In the first step, we trained two models, one based on convolutional neural network (CNN), and the other recurrent neural network (RNN), to detect nodules in CT scan. (2) In the second step, convolutional neural networks (CNN) are trained to evaluate the value of nine morphological features of nodules. (3) In the final step, logistic regression between values of features and cancer probability is trained using XGBoost model. In addition, we give an analysis of which features are important for cancer prediction. Overall, we achieved 82.39% accuracy for lung cancer prediction. By logistic regression analysis, we find that features of diameter, spiculation and lobulation are useful for reducing false positive.

[66] Engineering for psychiatry: a case study

Cedric Bornand, Angelika Güsewell, Alexia Stantzos, Emilie Bovet, Gilles Bangerter and Bertrand Hochet

To what extent can engineering be put to the use of psychiatry? Can a smart musical device help relieve patients with serious psychiatric pathologies during seclusion? With a view to answering these questions, a musical device called AMENHOTEP was developed in 2014 in line with the safety standards of seclusion rooms in the intensive care units (ICUs) of psychiatric hospitals [1] and validated in Switzerland and France by the Patient Safety Officers. The device is designed to withstand the physical outbursts of patients, which can be extremely violent. It consists of two interactive platforms, one placed in an ICU, the other in the caregivers' room. It allows the patient to choose to play one of four categories of music, each associated with a particular emotion: joyful activation, calm, nostalgia, tension. A first study, with qualitative results presented in [4], involved 12 weeks of interviews with the six caregivers [N1-6] of the five patients [P1-5] who were placed in an ICU equipped with the music installation. With the aim of highlighting the first, a second study was conducted in 2017 on eleven patients [A111] exclusively on the basis of measurements related to the use of the device. Since this is not the same sample of patients, this perspective should be interpreted with the utmost caution. The device has a simple and ergonomic interface, which allows patients to make choices and take decisions, a mechanism that naturally helps them regain control of themselves. It is also a tool to promote the patient-caregiver relationship, through the interest generated in listening, the musical choices of the patient and the reasons underlying those choices.

[87] A machine-learning approach for predicting success in smoking cessation intervention

Khishigsuren Davagdorj and Keun Ho Ryu

Smoking is one of the significant avoidable risk factors for premature death. Most smokers make multiple quit attempts during their lifetime but smoking dependence is not easy and many people eventually failed in smoking quit. Thus, predicting the likelihood of success in smoking cessation intervention is necessary for public health. In this paper, we analyzed real-world smoking cessation program derived from the Chungbuk Tobacco Control Center of Chungbuk National University College of Medicine in South Korea which collected from 2015 to 2017. Accordingly, the chisquare test and correlation analysis based filter feature selection method used to find the relevant significant features. In terms of the class imbalance problem, we have employed an efficient Synthetic Minority Over-sampling Technique (SMOTE) in order to generate new synthetic records. Subsequently, we evaluate the success prediction model of smoking intervention using gradient boosting and random forest classifiers respectively. Classifier performance evaluated precision, recall, F-measure which are most suited for imbalanced class situations. Our results demonstrated that SMOTE improves the performance of each classifier noticeable. Random forest classifier with SMOTE outperformed the precision (83.6%), recall (82.8%) and F-measure (82.7%), as well as gradient boosting classifier with SMOTE, showed precision (83.4%), recall (78.5%) and F-measure (80.6%), respectively. Furthermore, random forest classifier with SMOTE materializes slightly better result than gradient boosting classifier in recall and F-measure. In addition, the feature selection and sampling combined prediction techniques are supposed to be helpful tools in the decisions of smoking cessation.

[116] Identification of DNA Methylation Signatures for Diagnosis of Lung Adenocarcinoma

ongjun Piao, Kwang Ho Park, Keun Ho Ryu and Rong Xiang

Lung adenocarcinoma is the leading cause of death among men and women with cancer worldwide. Here, we performed an analysis of Illumina HumanMethylation450K data from TCGA to identify DNA methylation markers for lung adenocarcinoma diagnosis. We examined the DNA methylation landscape of lung adenocarcinoma and investigated the relationship between DNA methylation and clinical features. We then extracted differentially methylated cytosines in CpG island promoter regions, and then adopted machine learning techniques to determine the final methylation markers.

As a result, we identified three methylation subtypes of lung adenocarcinoma, and found that the methylation status was not significantly related with the prognosis of lung adenocarcinoma. We finally identified two novel lung adenocarcinoma methylation markers including cg14823851 (TBX4) and cg07792478 (MIR124-2) with the AUCs of 100%, 100%, 98.3%, and 100% on support vector machine, logistic regression, decision tree, and random forest, respectively. Overall, our study demonstrates the potential use of methylation markers in lung adenocarcinoma diagnosis and may boost the development of new epigenetic therapies.

[128] NOVEL FEATURES FOR DIAGNOSIS OF PARKINSON'S DISEASE FROM OFF-LINE ARCHIMEDEAN SPIRAL IMAGES

Jija Dasgupta and Bhabatosh Chanda

Parkinson's Disease (PD) is difficult to diagnose and is commonly a diagnosis of exclusion. A common early symptom of PD is handwriting and/or drawing difficulty. Most of the early systems rely on on-line handwritten / hand-drawn data which need specialized equipments to capture. Such costly systems may not be available where infrastructural facilities are limited. So we intend to devise a low cost system for the same purpose. Towards the goal, in this paper we present novel distance based features to diagnose Parkinson's disease from off-line hand drawn Archimedean Spiral. We have tested our algorithm on a benchmark database P aHaW . Performance of our system is compared with that of some existing systems. Experimental results suggest that proposed feature works good and is better than existing systems.

Special Session: Security and Privacy in Data-Aware Systems (3)

15:20-16:20 (Room 501)

[92] Device-Free Localization via Sparse Coding with Log-Regularizer

Zhaoyang Han, Chunhua Su, Shuxue Ding, Huakun Huang and Lingjun Zhao

As an emerging technology, device-free localization (DFL), using wireless sensor network to detect targets who do not need carry any attached devices, has spawned extensive applications, e.g., intrusion detection or tracking in security safeguards. Many previous studies formulate DFL as a classification problem, but there are still several challenges in terms of accuracy, robustness, etc. In this paper, we exploit a new logregularizer in the objective function for classification. With taking the distinctive ability of log-regularizer to measure sparsity, the proposed approach can achieve an accurate localization process with robust performance in the challenging environments. Even if the input data is severely polluted by noise with a level of SNR = -10 dB, our algorithm can still keep a high accuracy of 99.4%, which outperforms five other machine learning algorithms, e.g., deep auto-encoder, convolutional neural network, etc.

[113] Applying Convolutional Neural Network for Malware Detection

Chia-Mei Chen, Shi-Hao Wang, Dan-Wei Wen, Gu-Hsin Lai and Ming-Kung Sun

Failure to detect malware at its very inception leaves room for it to post significant threat and cost to cyber security for not only individuals, organizations but also the society and nation. However, the rapid growth in volume and diversity of malware renders conventional detection techniques that utilize feature extraction and comparison insufficient, making it very difficult for well-trained network administrators to identify malware, not to mention regular users of internet. Challenges in malware detection is exacerbated since complexity in the type and structure also increase dramatically in these years to include source code, binary file, shell script, Perl script, instructions, settings and others. Such increased complexity offers a premium on misjudgment. In order to increase malware detection efficiency and accuracy under large volume and multiple types of malware, this research adopts Convolutional Neural Networks (CNN), one of the most successful deep learning techniques. The experiment shows an accuracy rate of over 90% in identifying malicious and benign codes. The experiment also presents that CNN is effective with detecting source code and binary code, it can further identify malware that is embedded into benign code, leaving malware no place to hide. This research proposes a feasible solution for network administrators to efficiently identify malware at the very inception in the severe network environment nowadays, so that information technology personnel can take protective actions in a timely manner and make preparations for potential follow-up cyber-attacks.

[118] A New Steganography Method Based on Generative Adversarial Networks

Hiroshi Naito and Qiangfu Zhao

In this paper, we propose a new steganography method based on generative adversarial networks (GAN). In using steganography, the third party can extract the embedded secret easily by comparing the cover data and the hidden message if the cover data are publicly available (e.g. accessible in the internet). To avoid this problem, we need a unique cover datum for each piece of secret messages. As the cover data, we focus on digital images in this study. To make a lot of unique and natural looking images, we can use GAN. Actually, training of GAN results in two neural networks namely the generator and the discriminator. The generator makes virtual images, and the discriminator evaluates the naturalness of the virtual images. In the proposed method, we use both the generator and the discriminator to guarantee the naturalness of the cover data on the sender side, and to filter out stego data sent from malicious third party. In this experiments, we first confirmed the capability of the generator for producing unlimited number of cover data, and then investigated the possibility of naturalness checking using the discriminator. We believe that the proposed method can provide a better way for information hiding.

October 25

General Session 8

11:00-12:40 (Room 803)

[32] Using Smart Insoles and RGB Camera for Identifying Stationary Human Targets

Sevendi Eldrige Rifki Poluan and Yan-Ann Chen

Identity recognition is an important component for creating a personalized service in IoT applications. Current prevailing technologies have to pre-train with large datasets or need the privacy-sensitive information from users such as facial features, voice features, and fingerprint. In this work, we address the problem of identifying stationary humans (less movements) targets, which cannot be solved by other motion-based fusion mechanisms. In the future IoT world, many wearable sensors on human beings are foreseeable. We exploit RGB camera and smart insoles to design a system for dealing with the stationary identity recognition. We utilize machine learning algorithms to explore the correlation of lower body postures from the viewpoints of heterogeneous sensors. Then we can make the identity matching according to the trained models. Evaluation results show that our mechanism can achieve good performance if users' postures are differentiable.

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[48] Indoor Location Estimation of a Moving Subject Based on a Simple Motion Sensor Array

Ryo Ota, Tatsuya Hanyu and Qiangfu Zhao

The purpose of this study is to estimate human location in a room while protecting privacy. Our previous studies have revealed that a sensor array containing several infrared sensors could recognize human locations and preserve privacy. However, the previous location estimations were conducted on stationary human locations. In this paper, we aim to make the estimation more realistic and to estimate and track the locations of a walking person. That is, we want to estimate two functions x(D) and y(D) based on the observed sensor data D, where (x, y) is the coordinate of the location. Experimental results show that the estimated locations follow the real human locations very well even though we do not use the correlation between frames. This also implies that "tracking" is possible using a relatively small and sparse sensor array.

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[58] A Development of Ad-hoc Smart Room Based on User-oriented Context-aware System Architecture

Kohei Suzuki, Haruki Igarashi, Yusuke Manabe and Kenji Sugawara

Context is defined as information that represents the environment surrounding us. A system to provide services to users using context is called a context-aware system (CAS), and it has been widely studied. However, many conventional CASs are not flexible. As conventional CASs cannot be freely customized by end-users, they lack adaptability to environments, making them difficult to use in various environments. To solve this problem, we propose a user-oriented context-aware system architecture (U-CASA) for building ad-hoc smart rooms. This architecture allows end-users to install various IoT sensor devices to the target environment and to make it a smart room. The enduser can also freely customize the system settings and can link various contexts to a variety of services. In order to evaluate the proposed architecture, we built two ad-hoc smart rooms based on U-CASA. As a result of the demonstration experiment with behavior scenarios, we confirmed that two smart rooms can perform properly and can provide services despite their different environments.

Page 87 in Proceedings

[80] A Novel Maximum-Likelihood Detection for the Binary MIMO System Using DC Programming

Benying Tan, Xiang Li, Shuxue Ding, Yujie Li, Shotaro Akaho and Hideki Asoh

The multiple-input multiple-output (MIMO) system is widely used in wireless communications. For the problem of the discrete maximum-likelihood (ML) detection for the MIMO system, one can formulate it as binary quadratic programming (BQP). The general BQP problem is an NP-hard

problem, which is a challenge for finding promising solutions. The variable complexity is a special considered issue. In this paper, inspired by the optimization of sparse constrains, we employ a regularization approach to deal with the binary constraints in the proposed formulation and then introduce the difference of convex functions (DC) programming to solve the formulated nonconvex cost function. A novel and robust DC algorithm is proposed. Numerical experiments show that the proposed algorithm, which is based on DC programming, can achieve accurate results with a higher convergence rate.

[96] Data Acquisition Framework for Cloud Robotics

Yutaka Watanobe, Yuichi Yaguchi, Toshimune Miyaji, Ryuhei Yamada and Keitaro Naruse

In cloud robotics environments, software components play important roles by acquiring data from heterogeneous devices and then performing context-aware computing with the help of knowledge bases organized by the data. However, there are numerous tasks that must be performed to create such components, their corresponding database schemas, services, and repositories, and these tasks can be burdensome for developers. In this paper, a framework for constructing a data acquisition system with integrated robotic technology components and modern web-based technologies is presented. Our proposed framework enables developers to construct a robot environment with data acquisition functionalities by defining scenarios in an ontology language. The framework is realized in such a way that allows it to automatically generate the required software components and their corresponding repositories, which are deployed on the cloud. A case study showcasing the proposed framework is also demonstrated.

General Session 9

11:00-12:20 (Study Room 1)

[38] A Selective Modular Neural Network Framework

Intisar Chowdhury and Qiangfu Zhao

We propose a simple yet effective modular neural network framework for multi-class classification. The proposed framework significantly reduces the number of parameters while maintaining the accuracy comparable to more complex deep neural networks such as AlexNet and ResNet-18. The framework primarily consists of two major parts, namely a routing module and a set of expert modules. Each of the expert module is a binary classifier trained in Round Robin fashion. The novelty in this literature is on how we leverage the routing module to select only a small set of expert modules for each input datum during the testing phase. The selection of the expert module is carried out based on the routing module's soft-max scores for top-2 classes. In addition, each of the modules in the framework is very minimalist by design. The framework was evaluated on three real-world public data-sets. Empirical results show that with only a budget of 0.35M parameters we can achieve 99.56% accuracy on MNIST (0.2% improvement over AlexNet). For the FashionMnist dataset, with the same budget and network architecture as MNIST, we achieved 91.00% accuracy. For the UCI-HAR signal data, with a budget of only 2.5M, we can achieve an accuracy of 96.00% which is comparable to AlexNet (96.30%).

[109] Investigating Parallelization of Cross-language Plagiarism Detection System Using the Winnowing Algorithm in Cloud Based Implementation

Anak Agung Putri Ratna, Fransiskus Astha Ekadiyanto, Ihsan Ibrahim and Fathimah Rahimullah

The computational performance of cross-language plagiarism detection system using winnowing algorithm developed at the Electrical Engineering Department, Universitas Indonesia became an issue for real world application. This research is investigating the parallelization of such system implemented on a lab-scale multicore based private cloud platform using OpenStack. Parallelization was done on the portion of the program where the paragraphs of reference documents are processed. The result of execution time of the overall parallelized computation was able to reach speed up of 1.07 to 3.52 times compared to the execution time of the original serial computation.

[111] Latent Semantic Analysis and Winnowing Algorithm Based Automatic Japanese Short Essay Answer Grading System Comparative Performance

Anak Agung Putri Ratna, Lea Santiar, F. Astha Ekadiyanto, Prima Dewi Purnamasari, Ihsan Ibrahim, Dyah Lalita Luhurkinanti and Adisa Larasati

—In this paper, advanced of research on e-learning application for short essay grading system had been conducted. This system was developed based on the needs of Japanese Language study program for short essay examination that required time and focus for finishing those tasks. Human abilities are limited by their energy, so that cognitive assessment objectivity could decrease in line with the elapsed time. Latent Semantic Analysis (LSA) and Winnowing Algorithm are two methods used in developing the automatic short essay answer grading system called SIMPLE-O by Department of Electrical Engineering, Universitas Indonesia. These two algorithms are chosen based on its ability to do semantic analytic without the needs of understanding about the characteristic of its languages. LSA used Singular Value Decomposition (SVD) as its main method, besides Winnowing algorithm is based on fingerprinting. These algorithms are applied into the automatic system to assess the Japanese language exam with close results between them with average accuracy of Winnowing algorithm is only 1.06% lower than LSA that could gain 87.78%. These two algorithms should be suitable for grading short essay answer in Japanese language.

[130] A Study on the Tourism Features Extraction from Photos in a Tourism Website by Image Analysis

Shuang Li and Jun Sasaki

For a foreign independent tour, it is difficult to find personally adaptive spots. Therefore, it is necessary to filter the tourism features of the tourist attractions that are suitable for a foreign independent tour. In this paper, we attempt to find an effective method to extract tourism features from photos on a tourism website. We propose a method to extract the subjects that can be regarded as tourism features. To determine the threshold value for the filtering of features, we conducted an experiment to extract tourism feature words. We also compared the results with our previous work, and the feasibility and limitations of the proposed method have been confirmed.

General Session 3

11:00-12:00 (Study Room 2)

[63] A Deep Learning Model for Dimensional Valence-Arousal Intensity Prediction in Stock Market

Jheng-Long Wu, Chi-Sheng Yang, Kai-Hsuan Liu and Min-Tzu Huang

This paper proposes a dimensional valence-arousal method to define sentiment status in the stock market. In the past, many kinds of research have focused on the valence sentiment on stock messages because it represents the stock trend such as upward and downward. In this case, if the stock price jumps or collapses (positive/negative trend) in the short term, the investor will necessarily need to immediately trade at this moment, but some case is not. Therefore, the valence-arousal method can be used to define the trend intensity and trading intensity for a stock message of the stock market. In order to obtain a powerful prediction model to learn the intensity of trend and trading of a stock message that we propose a keyword-based attention network into Hierarchical Attention Networks (HAN), namely HKAN model, to learn the relation between dimensional sentiments (trend and trading) and stock messages. The experimental results show that our proposed HKAN model for stock VA prediction has outperformed other baseline models such as HAN and Hierarchical Hybrid Attention Networks.

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[67] Risk-Sensitive Portfolio Management by using Distributional Reinforcement Learning

Thammasorn Harnpadungkij, Warasinee Chaisangmongkon and Phond Phunchongharn

In recent years, many studies applied deep reinforcement learning in portfolio management. However, few studies have explored the use of value-based reinforcement learning as it is unclear how the risk of a portfolio can be incorporated. In this research, we proposed an agent called C21-SR by adapting the 21-bin categorical reinforcement learning and action-selection strategy based on Sharpe ratio to control the risk of investment and maximize profit. Our results revealed that a C21-SR agent could outperform buy&hold and constant rebalance strategies, and the action-selection strategy based on the Sharpe ratio could enhance the performance of categorical reinforcement learning in the financial market.

Page 110 in Proceedings

[114] Modeling and Prediction of Time-Series - A Case Study with Forex Data

Yi Chen Shiao, Goutam Chakraborty, Shin Fu Chen, Li Hua Li and Rung Ching Chen

Time series data reveals dynamic behavior of systems. A few real life examples are traffic flow, amount of rainfall, usage of electricity, share values, Forex rate etc.. Depending on the complexity of the system dynamics, algorithms differ to model the time series data accurately, so that the created model can be used for interpolation and more commonly extrapolation or prediction. For example, AR model performs well in stationary time series, but for non-stationary, it cannot capture the non-linear dynamics. In this research, we use Forex rate data, and experimented with various algorithms to capture the dynamics of the data. The success of the model is evaluated by accuracy in prediction. In our experiments, we applied two state-of-the-art models Support Vector Regression (SVR) and Recurrent Neural Network (RNN). The target of the experiment is the prediction of longer future by recursion (feeding back predicted value to input for the next step prediction). The result shows that RNN with proper Long Short-Term Memory (LSTM) has better performance in predicting longer future.

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General Session 6

11:00-12:00 (Study Room 4)

[50] A Proposal for Shape Aware Feature Extraction for Time Series Classification

Hidetoshi Ito and Basabi Chakraborty

Many new classification methods are proposed for time series data in this decade, including ensembles and deep learning based methods. However, speed for real-time classification, interpretability of the results and necessary computational resources, make them difficult to use in real life problems compared to traditional feature based or similarity based time series classification methods. Judicious use of local features of time series is supposed to be the key point to improve the performance and interpretability. In this work, three new linear time complexity shape aware feature extraction methods leading to the computation of similarities of two time series, are proposed. Their performances are compared to the most popular Dynamic Time Warping (DTW) with the k- Nearest Neighbor classifier (kNN) as the baseline classifier (kNN-DTW) by simulation experiments with 43 benchmark time series data sets. It is found that the proposed approach can achieve higher classification accuracies for some datasets while computationally lighter for all the data sets than DTW.

[122] Binary Owl Search Algorithm for Feature Subset Selection

Ashis Kumar Mandal, Rikta Sen and Basabi Chakraborty

Feature subset selection is one of the essential preprocessing tasks for numerous classification problems. This is because good feature subset can reduce overfitting of data, enhance the accuracy, and lessen the training time of a classifier model. However, finding the optimum feature subset is computationally expensive when the number of features is relatively high. Therefore, stochastic approaches are often used in attaining good feature subset within a feasible time frame. In this paper, we propose a binary variant of recent stochastic optimization algorithm Owl Search Optimization (OSA) for optimum feature subset selection. In this approach, six different transfer functions of S-shaped and V-shaped families were employed for generating six different binary Owl Search Optimization (BOSA) models. The proposed mechanism then employed on eleven publicly available datasets and performances were compared with popular approaches including, Particle Swarm Optimization (PSO), Genetic Algorithm (GA), and Harmony Search (HC). Results reveal that, for most of the datasets, BOSA-based approaches can produce optimal feature subset with reduced number of features and improved classification accuracy compared to other approaches.

[123] A Comparative Study of the Stability of Filter based Feature Selection Algorithms

Rikta Sen, Ashis Kumar Mandal, Saptarsi Goswami and Basabi Chakraborty

Feature selection is an important step prior to classification stage of machine learning, pattern recognition and data mining problems for addressing the high dimensionality of the data. It removes irrelevant and redundant features which lead to simplify classification process and improve accuracy. Several feature selection algorithms have been proposed so far and quality of the selected feature subset varies from algorithm to algorithm. One of the measures for assessing the quality of a feature

selection algorithm is its stability. Stability refers to the robustness of the selected feature set to small changes in the training set or set of various parameters of the algorithm. In this work, a comparative study of the stability of several well-known filter based feature selection algorithms, producing ranked feature sub set, has been done. Fifteen benchmark datasets from the UCI repository have been used for simulation experiments. Three types of stability measures, index-based, rank-based and weight based are used to evaluate the stability of feature selection algorithms. Simulation results demonstrate that for most of the datasets, JMD-based feature selection algorithm exhibits more stability irrespective of all types of stability measures. It is also observed that Relief shows the least stability.